# SCIENTIFIC AMERICAN

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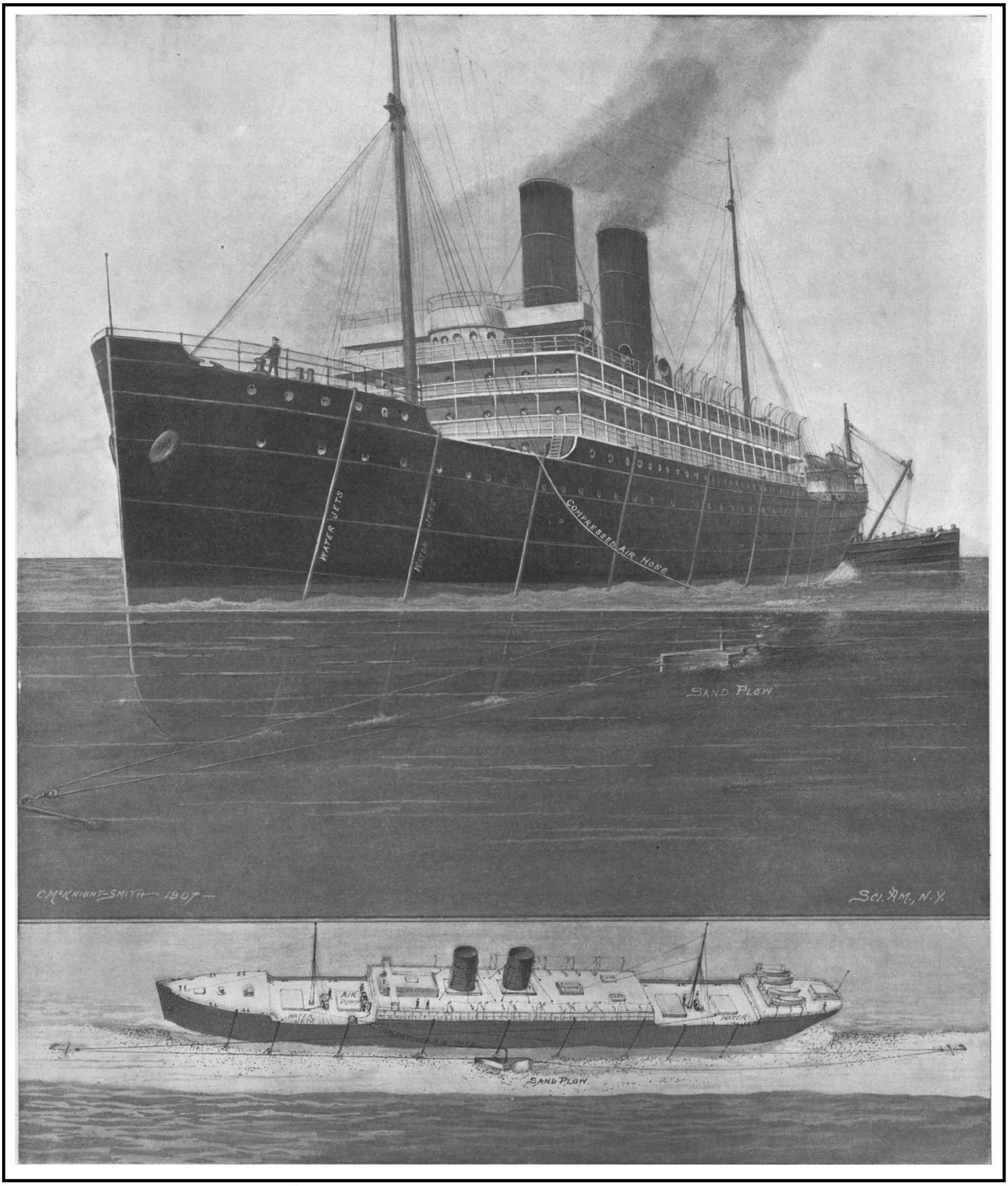
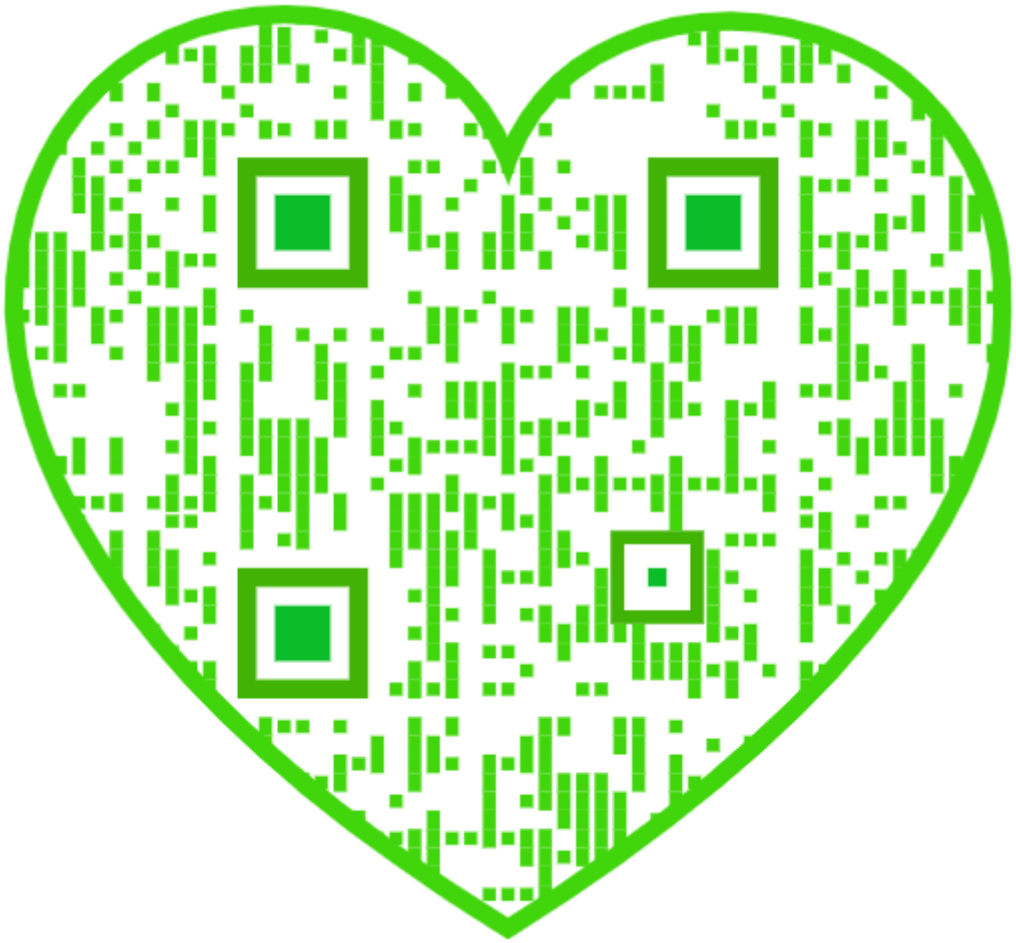



**The Plow Cuts a Furrow Alongside the Stranded Ship and Digs Her Free. Water Jets Keep the Furrow Open After It Is Cut.**


A NOVEL SAND PLOW FOR SALVING SHIPS.—[See page 42.]



# SCIENTIFIC AMERICAN

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NEW YORK, SATURDAY, JANUARY 18, 1908.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.


## THE REUTERDAHL ATTACK ON OUR NAVY.

### I.—WHO DESIGNED OUR NAVY? WAS THE SEA-GOING OFFICER IGNORED?

The present reply to the recent attack on the ships of our navy and the men who design them is, it is needless to say, in no sense inspired. It is written purely in the interests of truth, being based upon facts with which we have long been familiar, and most of which have appeared in earlier issues of the SCIENTIFIC AMERICAN; and it is devoid, of course, of any personal feeling. When Mr. Reuterdahl states that he is highly appreciative of the American navy, we believe him—and this in spite of the fact that, if all he alleges be true, the ships of that navy, under certain battle conditions, would be unable to fire their guns, and must promptly be sent to the bottom. Moreover, we are prepared to admit that some of the points in this article, and particularly those dealing with the bureau system and the scant encouragement shown to the American inventor, are well taken. But having made this reservation, we do not hesitate to say that, from first to last, the article is so full of technical errors regarding the ships themselves—errors which range from slight variations from the facts up to absolute misstatements—that, for any one who has an intimate knowledge of the material and methods of the navy, it carries its own direct refutation. But, unfortunately, of the thousands of American citizens who may have read this article, not one in ten thousand, probably, has any such knowledge of the facts; and hence it follows that no end of people, who have always taken a patriotic and very proper pride in our navy, must necessarily find their faith rudely shaken. Unfortunately, there have not been wanting certain officers of the line who have lent themselves freely to the questioning of the newspaper reporter, and have so far indorsed the general trend of the article, as to convey the impression that the whole of it is true; and this, in spite of the fact that they must know perfectly well that much of it is a gross exaggeration.

In the first place, then, let it be clearly understood that the present controversy is as old as the navy itself, and that many of the criticisms now made public have been urged over and over again; carefully debated; and action taken upon them in the secret, and very properly secret, deliberations of the Navy Department. It is the bold publication of the whole matter in an article whose inspiration seems to bear strong internal evidence of being semi-official, that has brought the subject so prominently and suddenly to the wide attention of the public. It is not our intention to enter, in the present issue, into any detailed refutation of the many misstatements made by Mr. Reuterdahl regarding the material, i.e., ships, guns, armor, etc., of our navy. This matter we shall take up in a succeeding article. What we wish to do here is to clear the ground, and put our readers in a position for judging the question more intelligently, by showing how it has become possible that there should be such an apparently wide divergence of opinion between the men who design our ships and the men who command and fight them. And let it be noted here, very carefully, that we speak of an *apparent* divergence of opinion; for we shall show that, so far from the sea-going officers having nothing whatever to say about what kind of vessels shall be built, they have been in the actual majority on the many boards that have determined the characteristics of our ships, *and on some questions have outvoted the constructors at the ratio of ten to one.* The Navy Department has been scrupulously careful to give them every opportunity to express their views, and, indeed, has been in the habit of sending out official letters inviting the most frank discussion and the freest offering of suggestions.

The designing of battleships and cruisers is without doubt one of the most complicated and difficult tasks in the world—so rapidly do new ideas become old, so swiftly do novel and revolutionary methods become popular. And the naval constructor would be more than human if, in the midst of these ever-changing standards and ideals, he should always succeed in building a ship that embodies only those elements which are bound to remain permanent in the years to come. At his best he is but human. He is no seer or prophet. At times he is bound to make mistakes; a fact which, as the official records show, he is perfectly willing to admit.

One serious fault and crying injustice in the whole of this discussion is the fact that the impression has been conveyed, and purposely conveyed, that the work of determining the characteristics of our warships is exclusively confined to the Bureau of Construction and Repair; that this bureau is a kind of "close corporation," extremely jealous of its prerogatives, and slow to accept any suggestions from the outside; and that it is peculiarly marked by that narrow range of outlook which is supposed to distinguish the purely technical, the "office" man, from the "practical" outside man. Now the merits of this question are necessarily of a nature which can be determined only by reference to the official records of the Navy Department; in which, fortunately, for this discussion, is to be found a full history of the deliberations which preceded the final choice of plans for the ships of our modern navy.

Who is it, then, that is responsible for the design of our warships, and what share, if any, had the sea-going officers in determining the characteristics of the ships which a certain clique among them now so freely condemn? There is a provision of the navy regulations by which the "general supervision over the designing, constructing, and equipping of new vessels for the navy" is delegated to what is known as the Board on Construction, which is composed of the chiefs of the four Bureaus of Equipment, Ordnance, Construction and Repair, and Steam Engineering, with an additional officer of the sea-going branch. The chiefs of the first two named bureaus are sea-going officers, and these two, with the additional officer above named, serve to place the sea-going element, as compared with the Construction Corps, in the proportion on this board of three to one. That does not look as though the constructive branch had any arbitrary control over the design of ships, or that sea-going officers were without adequate representation. Moreover, on the 1st of July, 1907, there were thirty-four sea-going officers serving as assistants in the Bureaus of Ordnance and Equipment, and on duty under the Bureau of Ordnance at the Washington navy yard. These thirty-four officers are thoroughly representative of the sea-going branch of the naval service, and are in close and constant touch with the chiefs of their respective bureaus; and advantage is taken of their wide practical knowledge in matters affecting the preparation of new designs. By this arrangement, the Board on Construction has the advantage of suggestions born of the practical knowledge of the sea-going officers, upon such features as magazine arrangements, ammunition stowage, coaling arrangements, and the location and method of installation of all mechanisms coming under the cognizance of the bureaus concerned.

Clear proof of the important part played by the sea-going officer in determining the military features of our ships will now be given in connection with the battleships which have been designed since the Spanish war; and just here, it will be well to draw attention to the fact that at the close of the war, and at the request of the Bureau of Construction and Repair, a special order was issued by the Secretary of the Navy to commanding officers of vessels, requesting that those who served during the war make reports as to the operation of their ships, specifying both the good points and the bad points, and suggesting any improvements which might be desirable. An analysis of the numerous reports submitted indicates that in the opinion of the sea-going officers of that period, such defects as existed were not of a serious character. The criticism was the result of the experience, under war conditions, of seventy-five officers; and they were so favorable as to lead the chief of the Bureau of Construction to state in his next annual report that *with regard to the strength, stability, seaworthiness, and maneuvering powers of the vessels of the various classes, the war experience tended to confirm the favorable opinions previously arrived at, and to demonstrate the general success of the designs.*

At the close of the war the three battleships of the "Illinois" class were in course of construction; and encouraged by the results of the war as indorsing the general system of construction, the plans of the new "Maine" class provided for vessels of the same general character as the "Illinois," but with more speed and greater displacement. Thus it will be seen that as far as the military features of the six battleships of the "Illinois" and "Maine" classes are concerned, *they were substantially indorsed by the specific reports of seventy-five officers who saw active service during the war, and that they were worked out by a board, the majority of whose members were sea-going officers.*

The SCIENTIFIC AMERICAN holds no brief for the Board on Construction; and we bring these facts before the public simply to correct the absolutely false impression that the determination of the leading features of our warships is restricted to a single bureau, and that it does not embody the rich and valuable experience of the sea-going officers of the line.

Following the "Maine" came the five ships of the "Virginia" class, whose otherwise admirable qualities are marred by the fact that they carry the double-deck turret—one of the most unfortunate mistakes ever committed in any navy. The double-deck turret was nothing new in our service. It was the design of a young ordnance officer which was enthusiastically taken up by the sea-going officers of the line, and, because of its *theoretical* advantages, became extremely popular. *It is on record in the files of the Navy Department that the naval constructors, to a man, bitterly opposed the introduction of this type of mounting, and it was installed upon the "Kentucky" and "Kearsarge" against their strong protest.* They opposed the turret on several grounds, among which were the following: That there was a lack of independent action of the 8-inch guns; that four guns of two different calibers on one single mounting would deliver a less volume and a less accurate fire than if the two types were separately mounted; that the great concentration of weight at the ends of the vessel and the enormous weight on the roller path were objectionable; that the efficiency of four important guns was dependent upon one controlling apparatus; and that the error of one gun pointer enters into four guns.

Unfortunately, after a bitter fight to keep it out of these five splendid ships, the influence of the sea-going officers was successful in incorporating the double turret. In the first plan for the "Virginia" class, the majority of the Board on Construction proposed an armament of four 12-inch guns in two turrets and eight 8-inch guns in four turrets, mounted amidships; but one sea-going member of the board dissented from the majority report, and recommended that four of the 8-inch guns be superposed upon the 12-inch turrets. This opened up the old controversy of the "Kearsarge" period, and in order to have the subject well thrashed out, the Navy Department made an addition to the original Board on Construction of eight additional sea-going line officers, thus forming a special board for the purpose. This board approved by a majority report the use of the superposed turret. Later, another special board was convened, consisting of the Board on Construction with the addition of two rear admirals and five captains; and, as a final result, ten out of the twelve members signed a majority report in favor of installing the superposed turret in the "Virginia" class. One rear admiral and the naval constructor signed a minority report. *In these two boards the ratio of sea-going officers to naval constructors was respectively ten to one and eleven to one, so that the superposed turret must ever be looked upon as the special protégé of the sea-going officer.*

The superposed turret, moreover, came very near being emplaced upon the "Connecticut" and the "Louisiana"; a minority report of the board which decided on their plans advocating an armament of four 8-inch guns superposed on the 12-inch turrets, and four 8-inch guns in broadside turrets. The final designs for these ships, from which the superposed turret was excluded, were adopted only after an extended discussion, in which the question of the battery arrangement alone was made the subject of report or suggestion by upward of eighty naval officers.

The designs for the following three ships, "Vermont," "Kansas," and "Minnesota," are practically identical with those of the "Connecticut," some slight changes being made in the distribution of the armor.

The faults of the two battleships "Idaho" and "Mississippi" are directly chargeable to the mischievous custom of Congress, by which it specifies the limits of displacement of the ships which it authorizes. This was put at the ridiculously low figure for a modern battleship of 13,000 tons, and on this limited displacement the board was requested to design, forsooth, "two first-class battleships carrying the heaviest armor and the most powerful ordnance of vessels of their class." Under the circumstances something had to be sacrificed. Four of the five members of the Board on Construction, including two of the three sea-going members, recommended a vessel with battery arrangement similar to that of the "Connecticut," but carrying four less 7-inch guns; with a lower freeboard aft; and having one knot less speed; submerged torpedo tubes

being also omitted. The Navy Department, before approving this report, invited an expression of opinion from nine officers of large experience in the navy, which was duly offered. In submitting its final report, the Board on Construction stated that the designs of these 13,000-ton ships did not "represent its opinion of what first-class battleships should be, nor what the United States navy should have."

The Naval Appropriation Act of March 9, 1905, authorized the construction of two 16,000-ton battleships, and the final plans of these vessels, which are now known as the "South Carolina" and "Michigan," embodied the all-big-gun idea. These ships were the first to embody an arrangement of turrets which, although it was subjected to much criticism at the time of its first publication, seems now likely to become the standard practice throughout the navies of the world. We refer to the method of mounting the eight 12-inch guns in four center-line turrets, so as to allow all of the guns to fire upon either broadside. This arrangement, like that of the emplacement of eight 8-inch guns in four turrets arranged quadrilaterally, as in the "Oregon," originated in the Bureau of Construction, and it bids fair to be a permanent feature in future battleships. The excellence of the design of these ships is beginning to meet with the approval which it merits; and we give the following quotation from a well-known *foreign* paper, which is devoted exclusively to naval matters: "Few, if any, ships are likely to be built in the future which cannot use all guns on either broadside. This may be taken as certain. America, in the 'South Carolina,' led the way in this direction, and the ship of the future is bound to be some improved variation of her.

*There is some good reason to believe that, taking all things into consideration, the 'South Carolina' type is the best all-big-gun ship yet in hand.*"

The plans of the 20,000-ton battleships "Delaware" and "North Dakota" were unanimously approved by the Board on Construction, the majority of whose members are, as we have seen, sea-going officers. They were subsequently referred to and approved by a special board, the majority of whose members were sea-going officers, and finally were indorsed by special act of Congress.

It will be evident from the foregoing review of the *facts* regarding the responsibility for the design of our warships, as recorded in the files of the Navy Department, that the ships of our navy represent the accumulated experience and critical judgment, not merely of one bureau of the department, but of the very pick and flower of the personnel of the navy. Having fully established this fact, we shall, in our succeeding issue, take up seriatim the charges made by Mr. Reuterdahl against the material of the navy, and we shall show that though, in one or two cases, the charges are to the point, they are, as a general rule, grossly in error.

## INAUGURATION OF ELECTRIC TRAINS UNDER THE HUDSON AND EAST RIVERS.

The year 1908 will be memorable for the beginning of subaqueous travel on a large scale between this city and Brooklyn and Hoboken, New Jersey, respectively under the East and Hudson Rivers, which for so long have only been traversed by the slow-going ferryboat, subject to delays of winds, fog, ice, and passing tows.

On Saturday afternoon, January 4, the first electric train, restricted to the officials and friends of the New York and New Jersey Railroad Company, made its first trip through the Hudson River tunnel from Hoboken, N. J., to the Christopher Street station, this city, a distance of two miles, in seven minutes. Under the river section a maximum speed of thirty-five miles an hour was attained. The new steel cars built for this service are provided with side and end doors, all pneumatically operated from one place in the car, which will facilitate the ingress and egress of passengers. The construction of this work was described in the SCIENTIFIC AMERICAN of March 26, 1904, and December 9, 1905. The tunnels connect with the subway now under construction under Sixth Avenue to 34th Street, and from Sixth Avenue east through Eighth Street to the present subway at Fourth Avenue and Eighth Street in this city. The president of the company carrying on this work is William G. McAdoo, who is also president of the company constructing the two tubes for suburban trolley lines under the Hudson River connecting Cortlandt Street, New York, with Jersey City.

Shortly after midnight on Wednesday, January 8, the Brooklyn extension of the Broadway Rapid Transit Subway passing under the South Ferry Subway station east at a 3.1 per cent down grade, by means of two separate tunnels under the East River and upward on the Brooklyn side through Joralemon Street (at which point the two separate tunnels merge into one) to Borough Hall, Brooklyn, located at the junction of Fulton Street with Joralemon Street, was opened by the first regular passenger train passing through from Broadway to Borough Hall station a few minutes before one A. M., January 9. There was a great celebration in Brooklyn over the event, many officials participating. Trains were run the rest of the night and all day on the 9th without any delays, to the great convenience of the Brooklynites. The average run from Borough Hall, Brooklyn, to the Battery station in New York was four minutes. From this station trains were run over the regular Subway *via* the Lenox Avenue route under the Harlem River to the terminus in the Bronx Borough. The time from Borough Hall, Brooklyn, to the Bronx Park terminus was 57 minutes. The distance is about 13½ miles.

It was found that the Brooklyn Bridge New York terminus was reached fifteen minutes earlier by the Subway than by the regular Brooklyn Elevated Railroad and Brooklyn Bridge route. On the first day some 27,000 passengers are reported to have been carried under the river. The diameter of each of the twin tunnels under the East River is fifteen and a half feet.

## WHY NOT AN AMERICAN "SCIENTISTS' CORNER" IN THE CATHEDRAL OF ST. JOHN THE DIVINE?

The interment of the late Lord Kelvin in Westminster Abbey in a spot which the London Saturday Review, with some phonetic misgivings, designates as "Scientists' Corner," calls to mind the circumstance that we have made no similar provision in this country for cherishing the memory of the men who have substantially contributed to the advance of science. More than any other country in the world, the United States of America owes its eminence to the practical application of discoveries made in the laboratory of the physicist and the chemist and in the workshop of the electrician. We have produced poets and painters of distinction, but we are great among the nations of the world because of our achievements in engineering and science.

Any effort to pay to American *savans* a tribute as noble as that which fell to the lot of Lord Kelvin is at once met with the difficulty that we have as yet no edifice commensurate in dignity with Westminster Abbey. In England, the Church and the State are bound by ties centuries old, and the Abbey may accordingly be regarded as an ecclesiastical monument which admirably serves the purpose of both Church and State. Robbed of its old religious character, but no less commanding in respect is the Pantheon in Paris, which serves for the burial of noted French poets, statesmen, scientists and other men adjudged worthy of fame. With these eminent foreign examples before us, the want of any similar mausoleum in the United States is naturally felt.

Inasmuch as we seem to have no State building of sufficient majesty, not taxed to its utmost capacity by the affairs of the government, for the realization of any similar project, we turn to the larger churches. The only structure which seems at all fitting for the purpose is the Cathedral of St. John the Divine, now in course of tedious erection on one of the highest points, if it may not indeed be considered the acropolis, of New York city. Here we have a pile which by reason of its architectural importance and hugeness will ultimately compare favorably with the cathedrals of Europe, and which in ecclesiastical importance surpasses any building of its kind in this country. Surely a corner may well be set aside in the finished cathedral for the fitting burial of the scientific men who have elevated their country to its present position and whose memories the nation must surely desire to cherish.

The pilgrimage which will be made to such a spot will lose nothing in reverence compared with those which are now made to the Poets' Corner of Westminster Abbey. The epic thought that weaves into a splendid, all embracing system the falling of a pin and the wheeling of stars ineffably remote, is surely comparable with that of "Paradise Lost." In imaginative power the creative scientist yields nothing to the creative poet, and a journey to the grave of the one should be as devout as a pilgrimage to the tomb of the other, however different the two types of pilgrims may be.

## THE USE OF GLASS FABRICS IN THE ELECTRICAL AND CHEMICAL INDUSTRIES.

In view of the very important part which glass has for a long time played in the electrical and allied industries, especially as an insulating material, it seems strange that glass wool, which is otherwise largely used, should hardly ever be employed in this connection. This is partly due to the scarcity of records on glass wool found in technical literature. An article on this subject by R. Lee was recently published in the Elektrotechnischer Anzeiger. The art of glass spinning was practised thousands of years ago in Egypt, but did not assume any importance until developed in Venice, when toward the end of the eighteenth century it spread as far as France and Bohemia. Glass spinners were then to be regularly seen as vagabond artists at the fairs of all countries. The art of glass spinning in its simplest form consists of rapidly attaching the end of a thin glass rod softened in the glass blower's lamp to a rotating disk, which draws it out to a thin thread. The diameter of the drum, which is running at a speed of 12 revolutions a second, being generally about 40 inches, the bobbin of the wound-up fabric will after being cut yield threads about 10 feet in length. Endeavors to obtain longer threads by unwinding the fabric were first made with some success toward the middle of the last century, when J. de Brunfaut designed a method of obtaining from a specially tough glass very fine threads, which would not break on being woven. The glass used by Brunfaut was made up of 68.93 parts of silica, 1.96 parts of alumina and iron oxide, 9.82 parts of lime, 0.49 part of magnesia, 14.13 parts of soda, and 3.92 parts of potash. These threads were used in connection with various kinds of fancy goods. Brunfaut, who may be said to be the author of the Bohemian glass spinning industry, further knew how to produce curled threads—glass wool and glass wadding—but kept this art a secret. His methods were improved by recent inventors, among whom should be mentioned the Brothers Weisskopf at Morchenstern, who first produced curled glass threads (glass wool and glass wadding) on a commercial scale. The chemical composition of the glass plays an important part in this connection. Glasses of different hardness, and accordingly different contractiveness, such as for instance a soft lead glass and a hard potash or soda glass, are melted simultaneously at a given ratio in the pointed flame of the blower, and this mixture is thrown on a rapidly-rotating wheel of rods. The thin thread thus produced, being made up of a juxtaposition of hard and soft glasses, is bound to curl on cooling. The fineness of these threads will be gaged from the fact that a glass-wool thread about 140 miles in length weighs only about one-third of an ounce. This glass wool, which as to its outward appearance perfectly resembles silk wadding, is a snowy white, and is such a bad conductor of heat as to produce by its simple touch a feeling of warmth. It is used to advantage against gout and rheumatism, and also for obtaining imitations of ostrich feathers or other ornaments. However, its most valuable application is for chemical and electrical purposes, glass being the best insulator for electrical conductors, in which respect it is far superior to silk, cotton, or India rubber. Glass wool and glass fabric have been used recently in producing a certain type of accumulators, in filling dry cells, and in manufacturing igniter accumulators for motor cars. It would afford a perfect material for insulating wires and cables; but at present it is too expensive to be used in this way, and the fact that glass threads are difficult to twist has been so far found another drawback. There are certain kinds of glass wool which will resist the action of a 20 per cent sulphuric acid solution, and similar wadding is used as filtering material. Glass-wool waste has been further used in insulating steam pipes; and as the manufacture of this article is now pushed very actively, its use will doubtless become far more widespread in the near future.

## THE CURRENT SUPPLEMENT.

The modifications made in the materials used in the building of all kinds of machinery have, without doubt, been greater during the past few years than in any preceding period. This improvement, covering practically the entire field of metallurgy, is ably considered by E. F. Lake in the opening article of the current SUPPLEMENT, No. 1672. Injectors are regarded as trustworthy boiler feeders, but there are numerous points to be learned and remembered concerning their operation and care, neglect of which will usually result in their failure when they are most needed. These points are considered by W. H. Wakeman in an article on the operation and care of injectors. Prof. A. E. Watson's ninth installment of the series of papers on "Elements of Electrical Engineering" is published. Motors for traction purposes are discussed. The recently constructed electric mountain railway on the German frontier has been placed in operation between the Schlucht Passage and Muenster. The road is described and illustrated in an article by Frank C. Perkins. The effect of vanadium in steel is considered by E. T. Clarage. In almost all branches of the manufacture of victuals and palatable foods, sweets play a prominent part. The most important of these are considered in an exhaustive article. An excellent biography of Sir William Crookes, accompanied by a portrait, is published. The author is P. Zeeman, who is most competent to write upon the great British scientist, for the reason that he has experimented himself in the same field. "The Star Vault and the Moving Observer" is the title of a paper by Jacob B. Brown, in which are discussed certain appearances on the star vault which ensue upon certain changes in the position of the observer. The usual Engineering, Electrical, and Science Notes will be found in their accustomed places.

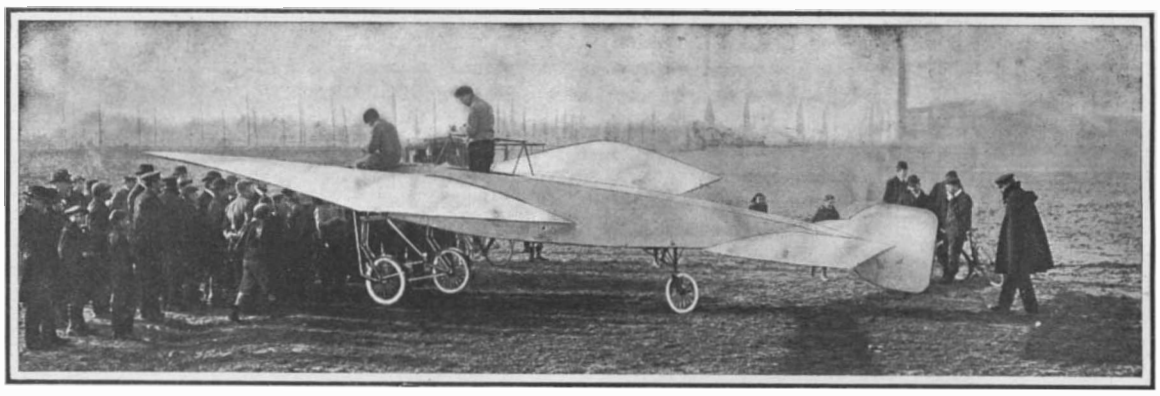
The French government has adopted a method of treating macadamized roads with hot coal tar thinned with about 10 per cent of oil. The cost is said to work out at about four-tenths of a penny per square yard.

## NEW EUROPEAN AEROPLANES AND AIRSHIPS.

BY OUR PARIS CORRESPONDENT.

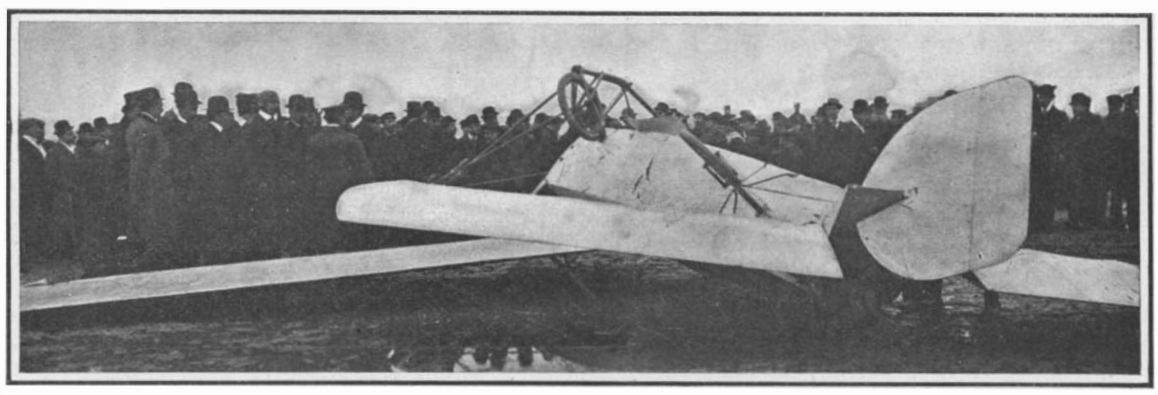
Aeronautical experimentation abroad still continues actively, and every day, almost, sees the production of some new airship or aeroplane, or new trials of those already constructed.

The latest of these aeroplanes is that of two Parisian aeronauts, Messrs. Gastambide and Mangin. This machine, which is shown in one of our illustrations, was constructed in three weeks' time. As can be seen from the picture, it is of the monoplane type, consisting of two wings attached to a central longitudinal body, the wings being set at a dihedral angle. The total spread of the wings is 10 meters (32.8 feet), while the length of the body is 5 meters (16.4 feet). The wings can be readily detached from the body part of the machine. They are attached to aluminium girders, which are sufficiently strong to sustain without injury the weight of a man standing upon them. They are braced by means of steel ribbons instead of steel wires, as the former do not offer so much resistance to the air. The aeroplane is mounted upon three pneumatic-tired wheels, the two forward wheels being pivoted so that they can be turned in order to steer the machine when it is running along on the ground.



**The Bleriot No. 6 Aeroplane As It Looked Before Its Accident.**

This aeroplane is a modified Langley-type machine the rear planes of which have been shortened and made to form a horizontal rudder. Spread of wings, 36 feet; supporting surface, 269 square feet; weight, 935 pounds.



**The Bleriot Aeroplane After Its Accident in Which the Wings Broke While the Machine Was in Flight.**

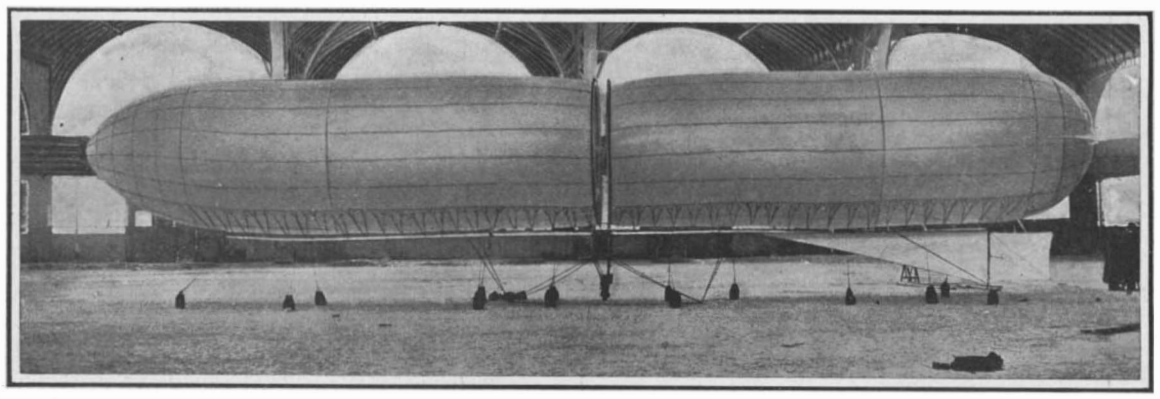
The photograph shows the machine upside down viewed from the rear and gives a good idea of the length of the rear planes as compared with those in front.

All the wheels are carried in spring-supported forks, which reduce the shock when the machine alights. The 50 horse-power, 8-cylinder, V motor is placed at the forward end of the body, and carries a two-bladed propeller upon its crankshaft. This propeller is 2 meters (6½ feet) in diameter and has a pitch of 1.3 meters (4¼ feet). The aeronaut's seat is placed back of the motor in the central part of the body. The machine has a vertical rudder at the rear, but no horizontal rudder is provided, as the inventors found from their experiments with a model that the setting of the planes at a suitable angle upon the body was sufficient. They expect to control the height of the aeroplane when in flight by varying the speed of the motor. The total supporting surface of this new machine is 24 square meters (258 1-3 square feet), and the weight, including the operator, is given as 400 kilogrammes (880 pounds). In tests which were made with the motor and propeller, a thrust of 140 kilogrammes (308 pounds) was developed by the latter. The inventors expect to attain a speed of about 33 miles an hour with their machine.

Two other of our photographs show the appearance of the latest Bleriot (No. 6) aeroplane before and after its mishap due to the breaking of the wings while in flight as a result of the failure of one or more of the guy wires. As can be readily seen from the photograph, M. Bleriot has modified the Langley type machine which he first used successfully last summer, until it is now practically a monoplane, since the rear pair of planes have deteriorated into a horizontal rudder formed of two planes—one on each side of the body—which can be separately set at different angles to allow of making a turn. There is also a vertical rudder placed between these two planes. The new machine is considerably larger and more powerful than its predecessor. It consists of a tapered body rectangular in cross section, and brought to a blunt point at the forward end. This body is carried upon three wheels, the two at the front end being pivoted for the purpose of steering when the machine is running along on the ground.

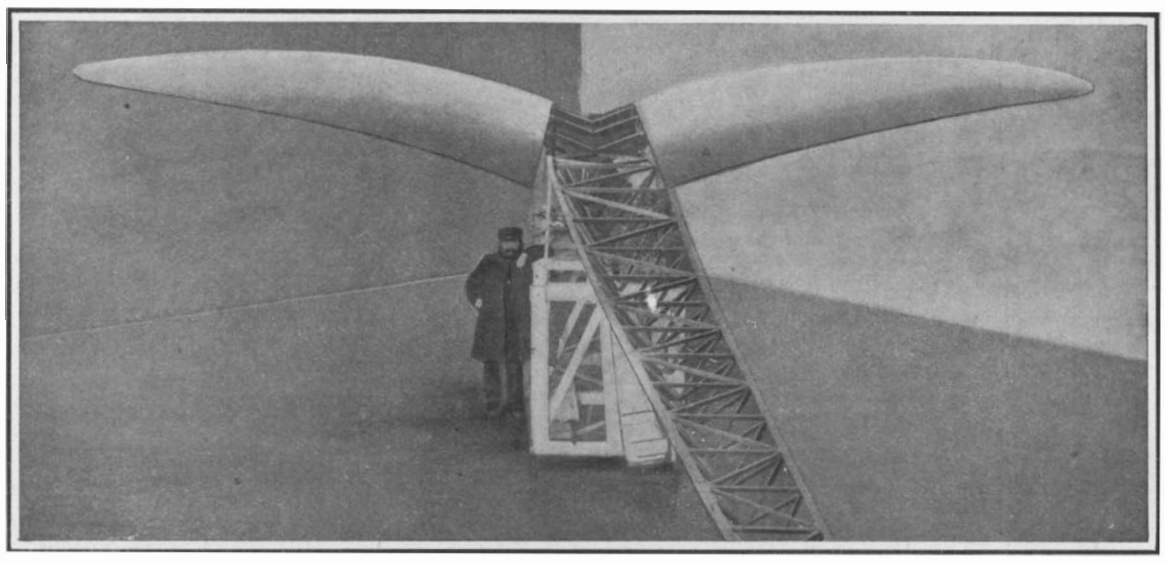
The third wheel is on a vertical fork beneath the body, a little more than half way back. Attached to the body on its lower side and near the forward end are a pair of wings having a total spread of about 36 feet, and a width from front to rear of about 7½ feet. The total supporting surface thus obtained is 25 square meters (269 square feet). As the total weight of the machine with operator is 425 kilogrammes (935 pounds), the surfaces are loaded to about 3½ pounds per square foot, which is a high figure. This new aeroplane has double the horse-power of Bleriot's previous one, the engine in this case being a 50 horse-power, 8-cylinder, V motor of the well-known Antoinette make. The engine is located in the forward part of the body over the front edge of the wings, and it carries a four-bladed propeller on the forward end of its crankshaft. This propeller has a diameter of 2.1 meters (6.88 feet) and a pitch of 1.1 meters (3.6 feet).

On November 16th, during its first test, the new aeroplane made a short flight at a speed estimated to be about 90 kilometers (56 miles) an hour. On November 29th, it made another flight of 150 meters (492 feet) at 2 or 3 feet above the ground, during which it showed excellent stability. On December 1st it made flights of from 80 to 150 meters (262 to 492 feet) at about 30 feet height. On December 4th it made flights of about 150 to 200 meters (492 to 656 feet) and also attempted to make a turn. On December 6th, in a



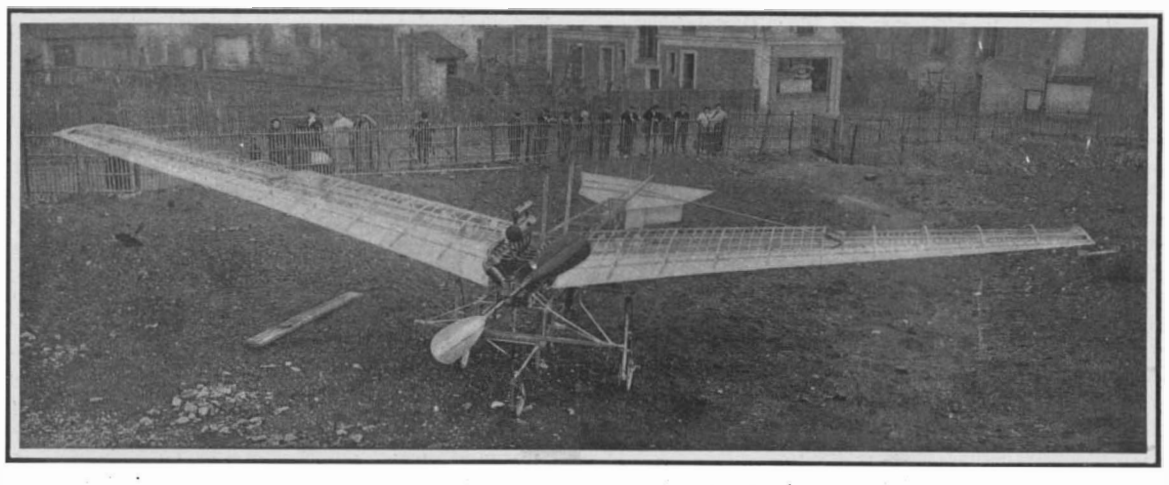
**The De Marcay Airship—A New Type of Dirigible Balloon.**

The location of the propeller between the two halves of the gas bag is intended to stop the pitching of the latter and also to propel it more easily.



**The New Antoinette Aeroplane, Showing Its Large Size in Comparison With a Man.**

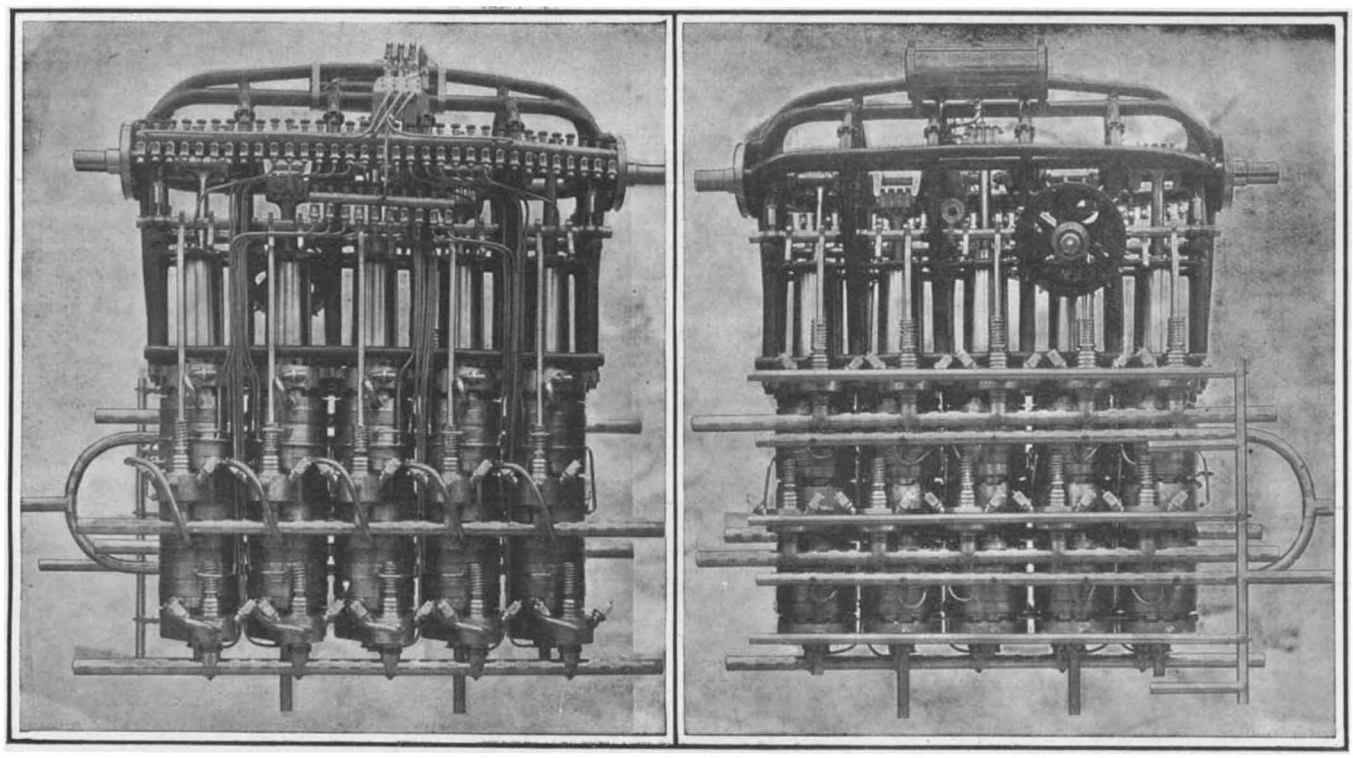
This aeroplane, which was built after Capt. Ferber's design, is the largest flying machine thus far constructed in France. It will have a 100-horse-power engine and the total weight of the machine and operator will be over 1,000 pounds.



**The Gastambide-Mangin Aeroplane—The Latest French Flying Machine of the Monoplane Type.**

Spread of wings, 32.8 feet; diameter and pitch of propeller, 6¼ x 4¼ feet; engine, 8-cylinder V motor of 50 horse-power.

**THE LATEST FRENCH AEROPLANES AND AIRSHIP.**



**The Dufaux 120-Horse-Power, 10-Cylinder, Double-Acting, Gasoline Motor for Aeronautical Work. Total Weight as Shown, 187 Pounds.**

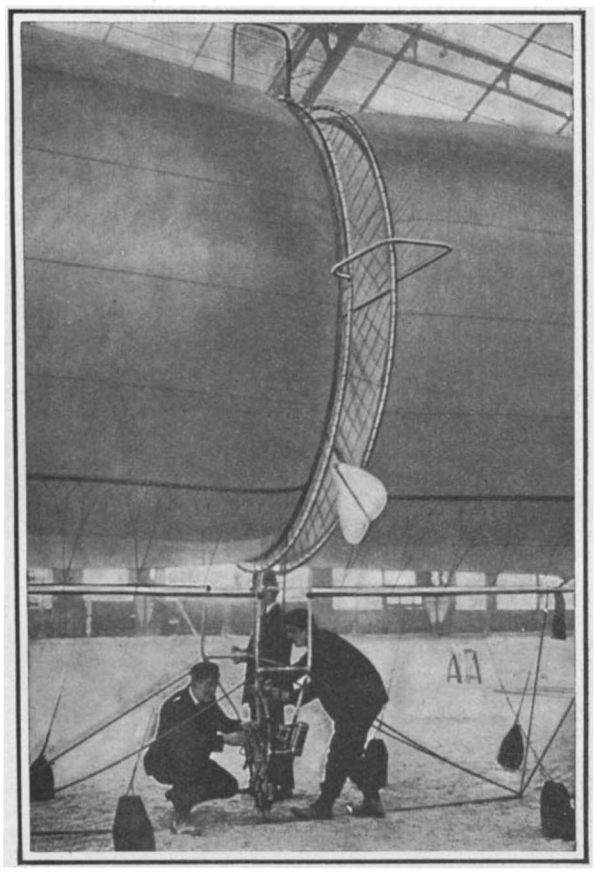
The motor, which is of the 4-cycle type, has ten double-acting cylinders arranged in pairs and connected to five separate cranks. As it is a double-acting engine there are in reality twenty working cylinders which give ten impulses per revolution of the crankshaft. There are forty spark plugs and forty valves, twenty of the latter being mechanically operated. The weight per horse-power of this engine is only 1½ pounds.

splendid flight of 400 to 500 meters (1,312 to 1,640 feet), it made a complete circle. It was on the 18th of December that the accident happened while the machine was in flight. One of our photographs shows its appearance after the accident. The machine struck the ground head first and turned completely over, and that M. Bleriot was not killed or seriously injured, seems quite marvelous. This accident has shown that constructors of aeroplanes should pay more attention to the strengthening of the parts.

Another of our photographs shows the new Antoinette aeroplane which has recently been constructed after the design of Capt. Ferber. As can be seen from the illustration, this aeroplane consists of two large concave wings attached to a central body which gradually tapers down to form a tail. The 100 horse-power, 16-cylinder, V motor is to be placed in the framework between the wings, and the aeronaut will sit just back of it. In the SCIENTIFIC AMERICAN of October 26, 1907, we illustrated this machine in course of construction, as well as the model in flight.

The photograph of the dirigible balloon which we reproduce herewith, shows the latest development in this line, which consists in dividing the envelope into two halves and attaching the propeller blades to the ends of a long shaft placed transversely of the envelope in the space between its two halves. The two halves of the envelope are fitted with rings of steel tubing at the ends where the division is made, for the purpose of strengthening them and holding them in shape, and also as a support for the short propeller shaft, which is concentric with the axis of the airship. A 6-horse-power motor placed below the gas bag is connected by a belt with the pulley on the propeller shaft. The blades of the propeller are about a foot in length. They exert a thrust upon the air in the immediate vicinity of the gas bag and at all points around it, and in this way it is proposed to do away with pitching. The gas bag has a total capacity of 4,838 cubic feet. The two halves are connected by four small U-shaped tubes, which tie together the two circular frames at the center, and also serve to put in communication the gas in the two halves and thus keep it under the same pressure. This new type of airship acted very well in the first tests which were made of it in the Galerie des Machines, at Paris. It moved along at a good pace upon an even keel, and did not require any rudder or flat planes to keep it going in a straight line.

The engine shown in two of our illustrations is the latest and lightest aeronautical motor which has been constructed in Europe. It was designed and built by the Dufaux brothers of Geneva, Switzerland, and it is built on the same principle as a small two-cylinder, air-cooled motor which they constructed over a year ago for a helicopter. The present engine is water-cooled, the cylinders being surrounded by corrugated copper water jackets, through which a liberal supply of water is forced by a suitable pump. As can be readily seen, the cylinders are arranged in superposed pairs, there being a stuffing box at the ends and in the common head of each pair of cylinders for the piston rod to pass through. The rod is connected to a cross-head that moves within a tubular guide and that is joined to the crankshaft by a connecting rod. The piston and piston rods are made hollow and very light, and they are thoroughly cooled by a current of air which is forced through them. The water is circulated by means of a centrifugal pump. There are three intake pipes for the water, running across the three sets of valve chambers, and two outlet pipes passing over the center of the water jackets and connected together by a curved pipe at one end. These pipes, as well as two of the inlet pipes for the gas, are shown in the right-hand picture, in which is also visible the distributer, the oil reservoir, and one of the cam-shafts for operating the valves. The gas-inlet pipes for the other two cylinders can be seen in the left-hand picture. The inlet valves are of the automatic type, and the exhaust valves are mechanically operated, although the push-rods for the lower set of cylinders are not shown in the photographs. The oiling of the motor is very complete. There are a large number of sight feeds, and these are supplied by three special oil pumps, which draw the oil from the oil reservoir and pump it at a certain pressure to the proper sight feeds, whence it is carried by a small oil pipe to the motor. The cylinders and crankshaft are mounted upon a framework of brazed steel tubes, which is very strong and light. This motor is said to give 120 horse-power at 1,500 R.P.M., and its total weight is given as 85 kilogrammes, or 187.3 pounds, which corresponds to 1.56 pounds per horse-power.

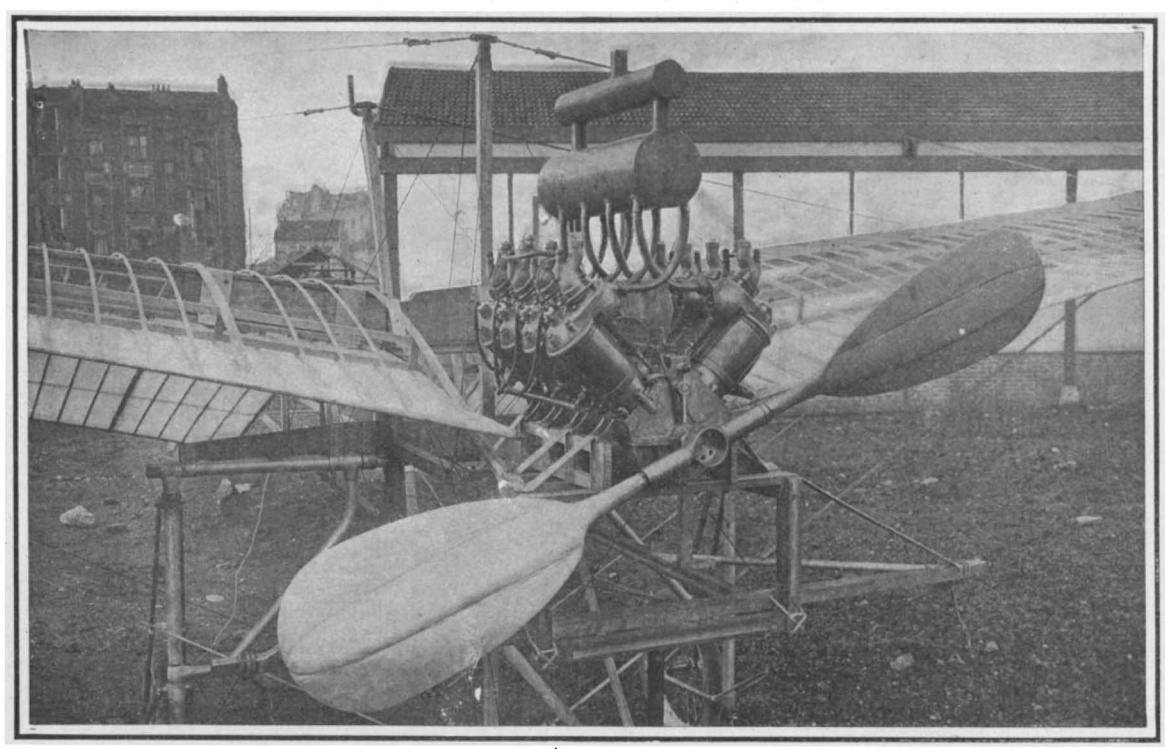


**Near View of the Space Between the Two Halves of the Envelope, Showing the Propeller Which Drives It.**

### A Record in Shipbuilding.

A 400-foot vessel has just been built and launched on the Tyne, England, in the record time of sixty-nine working days. The vessel in question is the steamer "Blackwell." She was specially constructed to the order of the Tyzack & Bancroft Steamship Company, Limited, and is designed for their "Well Line," trading between Middlesbrough and London and Calcutta. The principal dimensions of the steamer are: Length over all, 417 feet; breadth, extreme, 50 feet 9 inches; depth, molded, 29 feet 9 inches. The "Blackwell" has been constructed under Lloyd's special survey for their highest class on the spar deck rules and deep frame system, and has a poop 27 feet long, bridge 112 feet long, and forecastle 43 feet long. The officers', engineers', and passengers' accommodation is on the bridge, the saloon being tastefully fitted up in polished hardwoods, and the whole of this accommodation is heated by steam radiators. There is a most elaborate arrangement of deck machinery and derricks for the rapid handling of all kinds of cargo, and provision is made for dealing with lifts up to 25 tons weight. A complete electric light installation is now being fitted. This includes clusters of lamps to provide illumination when loading or unloading at night and a searchlight for use in the Suez Canal. The vessel was built at the North Sands Shipbuilding Yard, Sunderland.

Manganese, according to the American Machinist, is the best deoxidizing agent for nickel and its alloys, and is now extensively used. Not only does it remove the oxygen, but the sulphur as well.



**The 50-Horse-Power Antoinette Motor, Showing the Propeller Mounted on the Engine Crankshaft.**

The wings of the aeroplane are built up on wooden and aluminium girders. The duplex water tank is seen above the motor.

**POWERFUL AERONAUTICAL MOTORS AND DETAIL VIEW OF DIVIDED AIRSHIP.**

### JET CONDENSERS AND THE CHICAGO TO THE GULF CANAL.

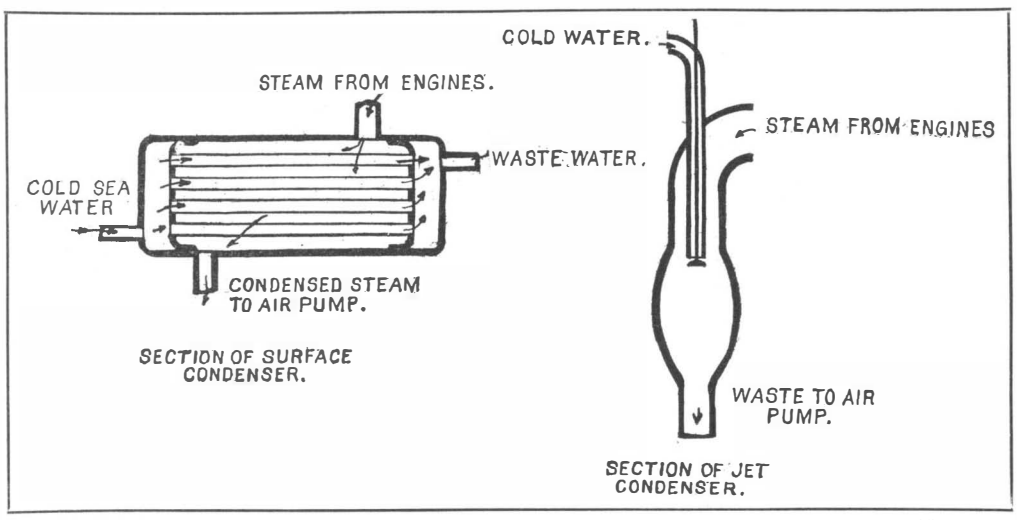
BY L. F. WILSON.

In connection with the proposal to construct a canal from Chicago to the Gulf, it is interesting to note that though it would be possible to bring steamers from the ocean to the lakes, it would be impossible to take the steamers of the lakes to the ocean for use in ocean navigation. The reason lies in the fact that, almost without exception, the steamships of the lakes are equipped with open or "jet" condensers for the exhaust steam of the engines and pumps. Were these steamers to be taken into salt water, it would be a matter of only a short time before the boilers and piping would be clogged with salt. The quantity of salt deposited would become greater and greater from the moment salt water was reached. Consequently, the steaming value of the boilers would diminish, until it would become impossible to drive the vessel farther under its own steam, without thoroughly cleaning the boilers and accessories.

In the case of the steamers designed for salt water, the steam is condensed in closed or "surface" condensers. True, there are steamships operating upon the lakes, which are fitted with the closed condenser; but, as this style is not nearly so simple in operation, and not so economical, only those vessels which are built with the idea of sending them to the ocean *via* the Welland Canal are equipped with them.

In view of these facts, a trip to and beyond the Gulf would necessitate a remodeling of the engine room of a Great Lakes vessel, although, if the trip on salt water were to be very short, it might be possible to carry the water for the boilers in the water bottoms of the vessel. The capacity of the water bottoms of the largest vessels would be sufficient to last two or three days at most. However, the usefulness of the deep waterway will by no means be limited to the through routing of freight from the lakes to ocean ports. On the contrary, the benefits of a cheaper means of transportation between Chicago and the large cities situated on the Mississippi and its tributaries will far outshine those of direct service to and from salt-water ports.

It is not to be understood, however, that the condenser problem limits the value of the canal, or should be offered as an argument against its construction, since existing vessels, as we have shown, would be altered to suit the new conditions; and all new vessels intended for both ocean and lake traffic would be equipped with a view to the double service.




**The Surface Condenser of an Ocean-going Vessel and the Jet Condenser as Used on the Lakes.**

#### Electricity in Dining Cars.

The Kölnische Zeitung, with reference to the recent terrible railway accident at Strasburg, in Germany, calls attention to the great danger connected with the kitchen in dining cars, where glowing coals and open flames are the rule. In the article mentioned attention is called to the fact that electrical engineers are already in a position to replace these fires and to supply safe apparatus. The writer adds:

"The difficulties with which electric train-lighting has had to contend are, in the main, the result of the fact that for illumination there must be a constant voltage which must not be interrupted, even for a minute, by the trains standing still, or for other reasons. Fulfilling these requirements calls for the use of accumulators, and special and complicated appliances; for cooking, nowever, it would be entirely feasible to produce the necessary current by a dynamo driven by the motion of the car itself direct from the axles. During the few minutes' stop, where trains containing dining cars are at a station, an interruption of the current for this short time would occasion little or no inconvenience; and where the kitchen must be in operation before the train starts, there is opportunity in every railway station to attach to a conductor and get the necessary current. Electric cooking appliances have already been brought to a great degree of convenience and perfection by several manufacturers, and their use is attended with so many advantages, that according to tests made and recently published, the cost per kilowatt-hour in Germany is only 15 pfennigs, inclusive of depreciation, and their use is cheaper than cooking with gas or coal."

The grandest train in the world is said to be the Kaiser's. It cost $1,000,000, and took three years to build. In the twelve sumptuous saloons are two nursery coaches, a gymnasium, music-room, drawing-room, furnished with oil paintings and statuary. The treasure-room, with its two safes, is burglar-proof.

#### A NOVEL SAND PLOW FOR SAVING SHIPS.

To aid in the refloating of ships which have run upon a sandbank or a soft shore, a sand plow has recently been invented to turn a furrow of sand away from the ship, and so loosen it. In the case of a steamship the plow may in some instances be worked by power supplied by the boat herself, and independently of outside help, but usually the services of one or more tugs are required. Our illustrations show how the plow is used in the case of a ship on a level or gently shelving bank where an anchor can be placed ahead and astern. Blocks are fixed to these anchors and ropes attached to the plow are rove through them and attached to winches on board. The plow, which has a double share, so that it need not be reversed on returning, is controlled from the deck of the boat by means of compressed air, and is dragged by the ropes backward and forward the length of the boat. A channel is thus cut in the sand, freeing the imprisoned ship. To remove the loosened sand and prevent the soft material around from caving in and filling the furrow a number of water jet hoses are suspended over the side of the boat. The screw may also be kept revolving, and with the water jets set up a current which carries off the loosened suspended sand.

#### Some Causes of Wrecks at Sea.

The abnormal storm weather which held on the North Atlantic during last November and December, delaying and battering ocean liners from the "Lusitania" downward, was responsible for many fatal accidents to smaller vessels. Seven men—the survivors of a crew of sixteen—who were recently picked up in the Atlantic after drifting eight days in an open boat, tell a tragic story of the loss of their ship. She was bound from Nova Scotia to England laden with wood pulp, and after fighting storms for a fortnight lost her masts, sprang a leak, and drifted helplessly.

#### JET CONDENSERS AND THE CHICAGO TO THE GULF CANAL.

For two days the men pumped, knowing all the time that it was merely a matter of time before the gaining water would be sucked up by the pulp, which would swell like a sponge and burst the vessel's seams. At last the end came, and the men took to the boats as the vessel went down.

There are many strange possibilities of disaster hidden in the holds of vessels; though the seaworthiness of modern ships minimizes them. Not only may wood pulp swell; cotton has burst into flame, a product of spontaneous combustion. A ship laden with bricks is in an awkward predicament if it springs a leak, for the dry bricks will suck up water and greatly increase their weight, dragging the vessel down. Timber-laden vessels on the other hand may become waterlogged, and refuse to sink. Such vessels, their masts gone and their decks awash, may drift for weeks, and so furnish another danger for ships; for one of them, a dead weight in the track of an oncoming ship, may wreck it.

Wood pulp, in this instance a fatal cargo, is often used for the safety of ships. A layer of cellulose is built into their sheathing, and in the event of a leak tends to swell, and so close the hole.

A dispatch from Berlin states that the Wireless Spark Telegraph Company claims to have beaten the Marconi transatlantic wireless record by about 300 miles. They transmitted messages for 2,290 miles, between Hallen near Berlin and a Hamburg-American Line steamer, the "Cap Blanco," off Teneriffe, in the Canary Islands.

Wireless telegraph messages have been received at Point Loma from Sitka, a distance of 1,905 miles. This is the longest distance across which a message has been sent on the Pacific coast.

#### Experiments of Prof. Bordas.

The experiments with precious stones which have been recently made at Paris by Prof. Bordas, and which we have previously referred to, will no doubt open an interesting field of research. It will be remembered that the fundamental principle embodied in these researches lies in the use of the radium rays for changing the color of precious stones when the latter are acted upon by the rays for a certain time, using bromide of radium as the source of the rays. The experiments require that the amount of radiation be as high as possible in order to give a decisive effect. M. Bordas has recently presented the results of his experiments to the Academie des Sciences in a paper. This we abstract from so as to show the exact scientific bearing of the action which is now discovered for the first time. It seems to prove conclusively that the color of precious stones is not due to the presence of a special oxide in the stone as is commonly supposed.

It is known that the stones of the corundum class are presented in nature under the form of differently colored stones, from the colorless and limpid sapphire down to the brown and opaque corundum. Between these two extremes we find a series of stones tinted in yellow, green, blue and red, with a widely varying scale of intermediate shades. It is generally supposed that these specimens owe their color to the presence of traces of iron, manganese, chromium, titanium, etc. The experiments which the author has been carrying out for some time in one of the laboratories of the College de France seem to show that the special color of each of these stones is not due to a special metallic oxide. In fact we are able to change the color of the stones and to make them pass successively from the primitive red color to violet, then to blue and green and finally from green to yellow. The experiment consists in placing, for instance, a bluish stone of this series (sapphire) under the action of radium bromide which has an activity of 1,800,000. Under these conditions we find that the color of the stone becomes modified, that it passes to a green color, then to light yellow, and finally to dark yellow. If we use the same method for a red stone (sapphire), the latter passes successively through the violet, blue, green, and yellow tints. By graduating the activity of the radium bromide or placing it at a greater or less distance from the stone, we are able to increase or diminish the strength of the action as desired. It is found that the stones which are treated in this way do not become radio-active in themselves. They do not become illuminated in the dark under the influence of pure radium bromide. We also observe that they do not lose their color under the action of heat. Judging from the progress of the phenomenon in the order which is just indicated, that is, the successive transformation of the colors from red to yellow, it seems that the topaz tint is the last term of the series. As to the theory of the colors of precious stones in general, we may perhaps suppose that they are placed in regions of the earth where the surrounding soil is radio-active to a certain extent. This hypothesis seems likely when we observe that the yellow sapphires are the most common, and on the other hand we often find sapphires which are colored blue and yellow at the same time, which seems to indicate that these specimens underwent a very slow modification analogous to the action just described. This work of Prof. Bordas does not break new ground. It carries forward the work of the late Prof. Berthelot.

#### Penetration of Heat into the Soil.

The penetration of heat from burning debris into the soil was tested after a recent fire at Berlin by Herr Effenberger, the director of the Hanover fire brigade, the results being as follows:

A very high insulating effect is exerted by even relatively thin earth layers, the temperatures varying from 520 deg. F. at a depth of 4 inches to 63 deg. F. at a depth of 40 inches. The increase in temperature noted at a depth of no more than 1 yard is thus seen to be very small. The moisture of the soil, however, plays an important part in connection with these phenomena.

The results were obtained by erecting three embankments about 40 inches in height with a slope of about 55 deg. and a square upper surface. Coke ovens, consisting of walls 5 inches in thickness and 32 inches in height, were placed on the top of these embankments, and after they had been filled with coke, the latter was set on fire.

# Correspondence.

### The Location of Mecca, Cal.

To the Editor of the SCIENTIFIC AMERICAN:

Being a subscriber of your valuable journal, I take the liberty of offering a correction. The issue of December 21, page 458, contains an article "Dates Thrive on Colorado Desert," and speaks of "experiments made at the government farm at Mecca, Ariz., with the date palm."

By way of correction I will state that Mecca is not in Arizona, but in California, some hundred miles west of the Arizona-California boundary line. The Salton Sea and Indio mentioned in the same article are also in California. The government has experimental farms in Arizona, however, one of which is at Yuma on the Colorado River, where dates have proved a success. W. A. LINFESTY.

Kofa, Ariz., December 30, 1907.

### Disposition of Armament on Warships.

To the Editor of the SCIENTIFIC AMERICAN:

The question has frequently suggested itself to me why, in designing the battleships of the "Michigan" and "Delaware" classes, only two turrets have been placed forward of the superstructure. The "Delaware" has three of her five turrets located aft of the superstructure, arranged obviously with a view to facility of stern fire. To one looking at her plan, the thought occurs that she was designed to fight while running from the enemy. Assuming that a battleship is intended to seek the enemy and not to run away from him, the natural arrangement of her armament would be such that the largest number of her guns could be brought to bear upon the enemy at the earliest possible moment. The vessel which can inflict the greatest amount of damage at the opening moments of an engagement certainly has a great advantage over her opponent. At the opening moments of an engagement the opposing vessels or fleets will necessarily be approaching each other, to a greater or less degree with bows on. At that stage of the conflict, a vessel of the "Delaware" type will for a considerable period have more than half of her guns blanketed by the superstructure. The designers of the "Dreadnought" evidently had these points in mind when they arranged to have six guns which could be brought to bear directly forward, although the plan adopted by them of course embodies the disadvantage of rendering two of her guns useless as soon as the vessel's bow swings away from the enemy.

An added advantage of the arrangement which I now suggest of placing eight of the ten guns forward of the superstructure is that every barbette placed forward of the superstructure affords an additional element of protection to the engines. It also allows of shorter and lighter propeller shafts.

Of course, these are merely the unprofessional views of an amateur, who is quite an enthusiast on the subject of the American navy. Doubtless all that has been here set forth has been duly taken into account by our designers, but I am somewhat curious to know what considerations have prevailed upon them to adopt a plan whereby six of the vessel's ten guns are liable to be withheld from participation in an engagement until a time when its outcome may have been decided. PHILIP TINDALL.

Seattle, Wash., December 26, 1907.

[Future engagements will be fought broadside to broadside, not end on. This was the plan followed by the Japanese with such success. By placing all guns on the center line, as in our new big-gun ships, all guns are available on either broadside. Hence there would be no advantage, even if it were structurally possible, which it is not, in placing eight of the guns forward of the superstructure.—ED.]

### Visible Speech.

To the Editor of the SCIENTIFIC AMERICAN:

In reply to your correspondent, E. F. McPike, in your November 23 issue, I would point out that "science already offers a perfect phonetic alphabet," which only requires to be better known to be in universal use by the commercial world, not only of the Anglo-Saxon, but of every nationality.

It is the creation of the late Alexander Melville Bell of this city, who gave to it the name "Visible Speech." In every respect it is a great scientific invention, being based on very accurate knowledge of the mechanism of speech, and profound study of the vocal organs of mankind.

"Visible Speech" is a species of phonetic writing, which constitutes a method of symbolizing the movements of the vocal organs.

The elementary symbols represent the parts of the mouth employed in speech, and when a sectional drawing of the mouth is made, the outlines of the organs in such a drawing are used as symbols to represent the organs themselves. It is the pictorial basis that gave rise to the name "Visible Speech." The symbol for the under lip, for example, is the outline of the under lip in such a drawing; so with the point of the tongue, etc.

Like the telephone, the discovery of Prof. Bell's son, Alexander Graham Bell, it is so broad in principle as to be above nationality, and can be used to show in visible form the construction not only of speech, but every sound perceptible to the human ear, which is within the compass of the human voice; so that those who are accustomed to its use can reproduce the sounds represented without ever having heard them. The acccuracy with which this is accomplished is limited only by the ability of a transcriber to catch each inflection of a sound and properly to note it; and the correctness with which the sound is reproduced depends solely on the proficiency of the reader, and the control he has over his vocal organs. It is thus possible by its use to represent every sound made by a human being, whether English, French, or Hottentot. That it has not long ago taken its rightful place among the great public utilities of the age, is due in large part to the fact that it was given freely to the world. Had it been covered by patents, as was the telephone, its use might have been forced on the notice of the community long ago by persons pecuniarily interested in exploiting it.

A new era in the history of "Visible Speech" is, however, now opening; Dr. Alexander Graham Bell having given his father's estate for the purpose of spreading the use of the alphabet by the publication of books written in its symbols, and the training of persons whose profession it shall be to teach its use in public schools.

It may be added that the great merits of this alphabet have been long appreciated by that most progressive of nations, the Japanese; many books having been published in its Japanese form.

One of the special claims made for it by its inventor was that it was "adapted to the telegraphing of all languages without translation." For further information, application should be made to Hon. John Hitz, superintendent Volta Bureau, Volta Place and 35th Street, Washington, D. C. M. G. BELL.

Washington, D. C., December, 1907.

### The Death of Prof. Charles Young.

By the death of Prof. Young, a manly, sweet, helpful life becomes a memory, but a living, uplifting memory to all who knew him. Esteemed, venerated, and loved by his students, who always spoke of him by the affectionately bestowed nickname of "Twinkle," he was to them a rare combination of teacher and protector.

Free from the petty exactions that are so apt to grow up around classroom work, his courses, most popular with the Princeton undergraduates, gave a truly remarkable insight into astronomy, and awakened developing minds to a desire to reach out into the soul-broadening fields of science. In his dealings with his men he was patient, considerate, gentle, and kind.

Though possessing a record of scientific attainment which without question gives him the title of the greatest astronomer our country has ever produced, the man was modest to a degree. Though he not infrequently referred to his discoveries, it was always in an impersonal manner, as of things beautiful in themselves, for which he deserved no credit. His attitude was that of the true scientist; he never spoke vauntingly or with self-pride.

Prof. Charles Augustus Young, who died in Hanover, N. H., on January 4, 1908, was born there on December 15, 1834. His father, Prof. Ira Young, who held the chair of natural philosophy and astronomy at Dartmouth College, gave him his preparatory education, and in 1853 he was graduated from Dartmouth at the head of his class.

From Phillips Academy, Andover, he went to Western Reserve University, where he taught mathematics, natural philosophy, and astronomy from 1857 to 1866. In 1866 he was made professor of natural philosophy and astronomy at Dartmouth, leaving in 1877 to become professor of astronomy at Princeton. From Princeton he was retired in 1905, and granted a pension from the Carnegie Foundation. At the time of his retirement, after an uninterrupted service of twenty-eight years in the university with which his name is so intimately connected, a loving cup was given him on which was inscribed in Greek:

"I know I am a mortal and the creature of a day. Yet when I search the close-set whirling circles of the stars no longer do I stand with feet upon the earth, but, seated with Jove himself, take my fill of the breath of heaven."

Most of Prof. Young's work was done in connection with the sun. While a professor at Dartmouth, he was one of the party that observed the solar eclipse of August 7, 1869, at Burlington, Iowa, making upon that occasion some important spectroscopic determinations. It was for his account of the reversal of the dark bands of the solar spectrum, noted for the first time in the eclipse of December, 1870, at Jerez, Spain, that he received the Janssen medal from the French Academy in 1891. In 1874 he observed the transit of Venus at Peking, China, and in 1882 made extensive observations of the transit of Venus from Princeton. He led many parties to observe solar eclipses, among others one from Princeton to Wadesboro, N. C., in May, 1900.

Dr. Young devised the automatic spectroscope in general use. He did much important work upon the solar spectrum and solar prominences, and verified Doppler's principle of the shifting of the lines of the spectrum from the violet to the red or *vice versa*, according as the source of light is receding or approaching. His most important achievement was the discovery of the reversing layer of the sun, by which the bright lines of the photosphere are transformed to similarly situated dark absorption bands.

Many honors were bestowed upon him. He was a member of the National Academy of Sciences, a fellow and ex-vice-president of the American Association for the Advancement of Science, an associate fellow of the American Academy of Arts and Sciences in Boston, an honorary member of the New York Academy of Sciences, and of the Philosophical Society in Philadelphia, and a foreign associate of the Royal Astronomical Society of Great Britain. The degree of Doctor of Philosophy was bestowed on Dr. Young by the University of Pennsylvania and Hamilton College, and that of Doctor of Laws by Wesleyan, Columbia, Western Reserve, and Dartmouth.

In addition to his duties as teacher and as investigator, Dr. Young wrote many books; among them "The Sun" (in the International Scientific Series), "A General Astronomy," "Elements of Astronomy," "Lessons in Astronomy," "Manual of Astronomy," and "Uranography."

### Death of Dr. Sellers.

Dr. Coleman Sellers, engineer and scientist, died at his home in Philadelphia on the night of December 28, 1907, aged 81 years.

Born in 1827, in the city where he died, Dr. Sellers's education was obtained at private schools and at Bolmar's Academy.

After serving the Globe Rolling Mill, of Cincinnati, first as draftsman and then as superintendent, he went to the locomotive-building firm of Niles & Company, where he for five years held the position of foreman.

In 1856 he entered the firm of Sellers & Co. as chief engineer. Soon after he was made a partner, giving his attention to active business until the year 1888, when he retired and devoted himself to private practice as a consulting engineer.

He served on the International Niagara Commission with the late Lord Kelvin.

The King of Sweden in 1887 conferred on Dr. Sellers the Royal Norwegian Order of St. Olaf. In 1888 he received from the Stevens Institute the degree of D. E., and one year later the University of Pennsylvania conferred upon him the degree of D. Sc.

Dr. Sellers was a member of the Board of Managers of the Franklin Institute, and was its president for five years. He was also president of the American Society of Mechanical Engineers and of the Pennsylvania Museum and School of Industrial Art.

His inventions are nearly all of a mechanical nature. Among them are a coupling device for connecting shafting, and a connection of feeds for lathes. He also suggested the use of absorbent cotton in surgery.

The head of the United States Weather Bureau has prepared plans for erecting kiosks containing recording instruments in the busier parts of our large cities. Official or newspaper data, which are often taken from instruments placed at a considerable distance above ground, are not altogether accepted by the "man in the street," who feels the bitter blizzard or the blazing sun from which the instruments are shielded. The booths or boxes will be built so as not to exceed two feet square and six or eight feet high, and with a view to making them as sightly and as decorative as possible. They will be made to conform as much as possible to their surroundings, with the idea of making them as familiar articles to the public as the mail boxes or fire-alarm stations. In addition to the permanent instruments weather maps and such data as are of popular information will be displayed on the sides of the booths and will be kept up to the minute by boys on bicycles. If the plan proves as popular as is expected, it is probable that the weather kiosks will be established all over the country.

The occurrence of spinel in blast furnace slags appears to have been first determined in 1880 by Muirhead, who found that highly aluminous slags left a proportion of very intractable residue varying from 5 per cent to 17½ per cent of the whole weight. This when analyzed proved to be spinel, with about one-third of the magnesia replaced by iron.

## THE HUICHOL INDIANS OF MEXICO.

BY WALTER L. BEASLEY.

One of the strangest and most interesting ethnological collections ever brought out of Mexico is that recently obtained by Mr. Carl Lumholtz, the well-known explorer, from the Huichol Indians. Hitherto they have been practically an unknown race, living in a remote and almost inaccessible canyon or valley in the wilds of the Sierra Madre mountains, in the State of Jalisco. The Huichols number some 4,000, and their habitation is a territory 40 miles long by 25 wide, walled in by steep mountain barriers of from 5,000 to 8,000 feet. Here, unvisited and almost completely isolated from the outside world, they are to-day said to be living in the same state of aboriginal culture as when Cortez first put his foot on Mexican soil. Their history is obscure. They were conquered by the Spaniards about 1722. They have no Christian priest and no missionary work is carried on among them. The whites and Mexicans have not settled in their country, as the mountainous character of the land offers but limited areas suitable for cultivation. The introduction of sheep, cattle, and iron implements has modified their lives to some extent, but their ancient beliefs, customs, and ceremonials still remain in all their pristine vigor.

The Huichols afford, therefore, a fresh and untrodden field of anthropological research. Their homes, or ranches, are located in the valley formed by two parallel mountain ridges; the latter are covered with immense pine forests, and being the abode of numerous deer, furnish the hunting grounds of the tribe. Corn, beans, and squashes are their main agricultural products, though cotton is raised on a small scale. The modern plow is not used, but the crude and old-fashioned method of planting corn in holes made by sticks is employed. Owing to this primitive way of farming on the steep hillsides, an extraordinary amount of rain is needed to nourish the growth of the crops, as the water runs off without penetrating far into the soil. They live mostly in circular houses or huts made from loose stones and mud, covered with thatched roofs; their sacred god houses are of similar shape, but much larger. They dress in garments of their own manufacture, the men wearing mostly a shirt of cotton cloth, often elaborately embroidered, the women a skirt and tunic, both made of cotton cloth. Sandals of cowhide are worn. The women are

1. The deer god, who controls the hi'kuli and deer hunting. 2. Ceremonial arrow with corn cakes attached. 3. Arrow with fifteen prayers attached, for success in hunting and recovery from sickness. 4. Arrow praying for a good gourd crop. 5. The hat of a hi'kuli seeker. 6. The fire god, the principal deity. 7. A girdle woven by the women. 8 and 9. Types of the looms used. 10. A snare for deer—a prayer for success in hunting. 11. Ceremonial bamboo chair for the god of fire. 12. A shaman's drum, fashioned from a hollow log.

**Domestic and Religious Articles Used by the Huichol Indians.**

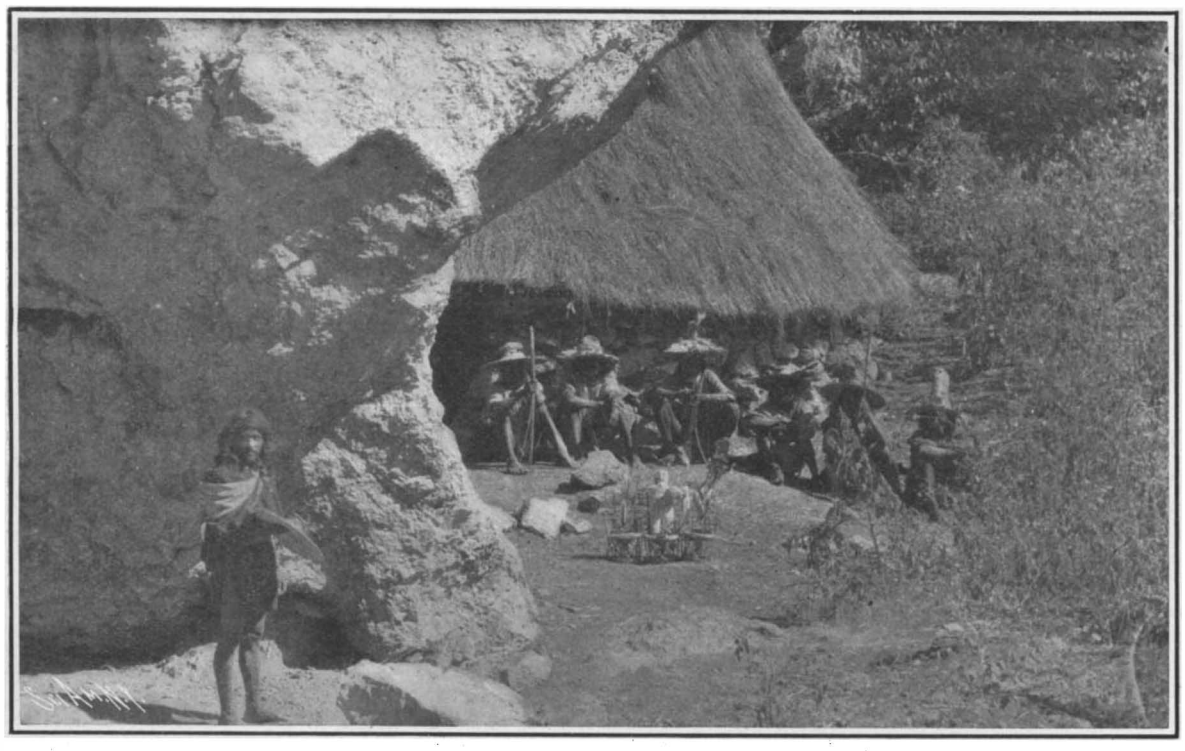
**Hi'kuli Hunters About to Start on a 43-Day Journey to Gather the Rain-Making Plant.**

THE HUICHOL INDIANS OF MEXICO.

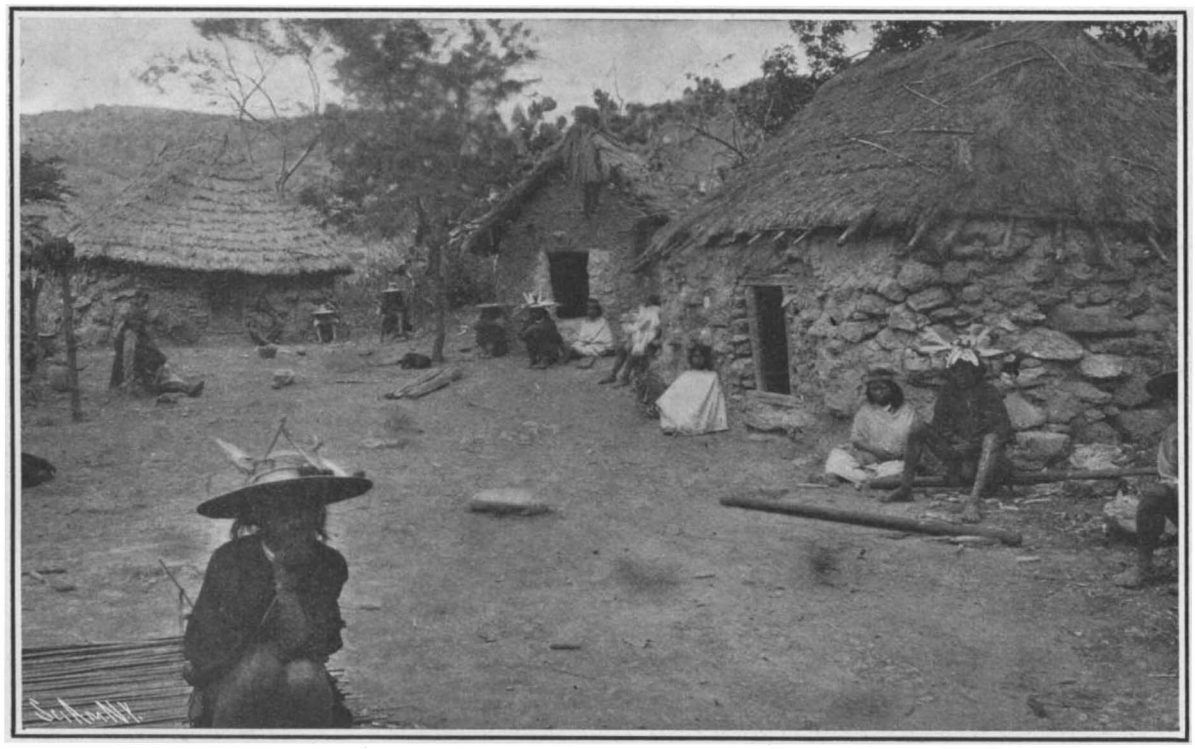
skillful at weaving and embroidering, and make quite artistic girdles, hair ribbons, and pouches, both for their own wear and to adorn the clothing of the men.

Mr. Lumholtz was the first white traveler and investigator to visit and dwell for a year or more among this hermit race, during which time he obtained much valuable information and gathered many specimens illustrating their industrial life, but particularly their peculiar symbolism. This material is now installed in the American Museum of Natural History. The most surprising and characteristic feature of the whole exhibit, however, is the curious array of sacred and symbolic objects used to implore their gods for various material benefits, or on their frequent ceremonial occasions. The writer is able to present a series of photographs of some of the most important of these, and also afford a realistic glimpse of the dress, appearance, homes, and god houses of the Huichols. The general significance of the ceremonial

Huichol in Typical, Home-Made Embroidered Costume.



The Sacred Cave. Birthplace of the God of Fire.



A Huichol Ranch or Village.

## THE HUICHOL INDIANS OF MEXICO.

paraphernalia here pictured is based on the explorer's report, who obtained their meaning from the Shamans, the leading wise men of the tribe, most familiar with the ancient beliefs and customs.

Of the half dozen or more prominent gods, two of the most powerful are the God of Fire and the Deer God. The gods are natural phenomena personified, and represent the Four Elements; besides, they are to the Indian mind also human. Images of the gods are thought to prevent a drought, or to drive off some serious disease or other tribal misfortune, and are carved out of solidified volcanic ash, and sometimes out of wood. The most important gods stand on disks made from solid volcanic ash.

The most sacred spot in all the country is the great rock-cave and the birthplace of the Fire God, which is here pictured. The rock inclines slightly forward and is dark red, hence its association with the God of Fire. The heat reflected from the rock forcibly suggests his presence and he is identified with the volcanic fire of the underworld. He is the God of Life and Health and the particular god of the Shamans, especially of those who cure and prophesy. The Deer God is asked for good luck in hunting the deer and is frequently employed for luck by the women in their textile work. The one essential blessing and benefit desired by the people is that of rain. Therefore the Huichols are from the cradle to the grave more or less consumed in a prayer for water, and their time is almost given up to the preparation and observance of rain-making feasts and in the fashioning of various symbolic offerings, intended to propitiate the gods, who are thought to have control over the clouds and rain. In each village there is a large temple, around which stand a number of small god houses, sacred to the various deities. Inside these are deposited the symbolic objects made by the people. The most important of all the votive offerings and the ones most frequently employed are arrows. They are considered a kind of messenger to the gods and are inseparably connected with the life of the Huichols. For any event of importance for which he prepares, or that may happen, he makes an arrow, asking the protection and favor of some god. When the Indian wants to hunt deer, till the soil, build a house or marry, he has to make an arrow to insure success in the undertaking. The arrow is supposed to take its course toward the deity. A great many symbolic objects of various colors and shapes are attached to the arrow. They are stuck into the seats of the ceremonial chairs in the god houses, into the straw roofs of the same, and in all sacred caves and spots where some god lives, whom the imaginative Huichol may implore and appease.

Three of their most elaborate arrows are here shown. They were made to hold rings of curious ceremonial cakes which are attached to them by strings. The cake strings are dedicated to several of the most important gods and are colored like those of the corn belonging to each god. They are small corn cakes which have been toasted until they have become hard, and are then tied by a twine of bark fiber to the arrow. Such cake strings are looked upon as the necklaces of the gods to whom they are dedicated. A fine specimen of a special deer-hunter's arrow is pictured, which was suspended in his god house. The arrow has some fifteen attachments, five being ceremonial snares, which symbolize luck in hunting the deer, made from pieces of reed in the shape of a triangle. The other attachments consist of symbolic objects, such as front shields, being prayers for success in hunting of the deer. One of the features of this arrow is a crude representation of the wife of the deer-hunter, embroidered in dark blue on a piece of textile, the first dangling attachment on the left. She was sick and one of the means to restore her health was to place her image on the magic arrow. One of the strangest sights in the sacred caves and god houses is the number of chairs deposited there for the gods, the purpose being to express adoration of some god or more generally to embody prayers for various things. The main idea is that the gods will take their seats in the chairs, and the various objects stuck and attached to these will at once attract the attention of the deity, who will understand their meaning. Thus, to the back of the chair of the God of Fire will be attached a tobacco gourd, which is a prayer for luck in raising the small squashes from which tobacco gourds are made. The chairs are also filled with ceremonial arrows, stuck upright in the seats. In the temples on festive occasions the Shaman always sings, seated in one of these chairs. They are made of split bamboo sticks, tied with strips of strong bark.

One of the most important of the feasts is that of Hi'kuli. This is a small cactus-plant which grows in the central part of Mexico. It is thought to be necessary to procure it every year to insure the country

against drought, and in October parties of twelve, or more, start on a pilgrimage to the interior. This journey consumes forty-three days. On the return of the hi'kuli seekers with their loads of the plant a great feast of dancing, occupying a week or more, is held. According to the Huichol myths, hi'kuli sprang from the forehead of a deer, who left the hi'kuli plant in his track the first time he appeared in the country. A group of the hi'kuli hunters in their ceremonial costumes is here shown. It will be seen that the tobacco gourd forms a conspicuous part of their outfit, each carrying a dozen or more of them. Inside one of these are carried packages of sacred tobacco. All tobacco gourds are dedicated to Grandfather Fire, as the Fire God is called. The hi'kuli hunters are always seen with plumes stuck on their home-made straw hats, the brim being entirely covered with the tail-feathers of the turkey, the quills having been attached to a string tied around the crown. The one here shown, however, is adorned with the tails of the gray squirrel. A very odd and primitive drum is used by the Singing Shaman during his incantations and musical performances in the temples. This is made from a hollowed-out log, the ends being cut to form three rude legs. The top is covered with deer skin. The Shaman beats the drum with the palms of his hands, making two quick beats with the left, holding the right one high up and bringing it down once. In order to keep the skin tight a piece of lighted pine wood is placed inside of the drum, which contracts the skin. The Shamans are supposed to be in close touch with the gods, and know how to appease their anger. By singing epics for two successive nights at each feast, reciting the ancient deeds of the gods, and the subsequent sacrifice of oxen, etc., the deities are pleased, and they consent to give up the clouds in favor of the Huichols, who thus gain the much-desired rain.

Additional scientific attention, however, is just directed toward this little known Indian tribe, from the fact that an expedition from the Ethnographical Museum of Berlin, under the leadership of Dr. Theodore Preuss, has recently returned from a two years' sojourn among the Huichols and their neighbors the Coras. Nothing at this writing has been announced in detail as to the material obtained, but myths, legends, symbolic and ceremonial objects, similar to the specimens herein described and pictured, were undoubtedly secured.

## HOW THE SPEED OF LIGHT IS MEASURED.

The first real knowledge of the velocity of light was attained in the latter part of the seventeenth century (about 1676) when the Danish astronomer, Olaf Römer, succeeded in approximating the velocity by noting the time which elapsed in the occultations of Jupiter's satellites when the earth was nearest and farthest away from the planet.

Early in the nineteenth century the celebrated French savant Arago proposed the first experimental method, which was suggested by one advocated by Wheatstone for the determination of the velocity of the electric current. Essentially this method is as follows: Referring to Fig. 1, $R$ is a plane mirror capable of being rotated with extreme rapidity about an axis perpendicular to the plane of the paper. $M$ is a fixed mirror. Suppose a condenser to be discharged at $C$. A ray of light will be transmitted to $R$ (which is now supposed to be at rest) and reflected in the direction $R L_1$. A second ray is transmitted to $M$, and is reflected back again through $C$ to the same spot on $R$ as with the other ray, and consequently along the same line $R L_1$. The distance traversed by the two rays will differ by twice the distance $C M$. In fact, the second ray would fall upon $R$, not at the same time as the first ray, but after the lapse of a time interval. This time interval would be precisely the length of time required for light to pass over the distance $C M + M C$. It was proposed to measure this exceedingly minute interval of time in

Fig. 1.

the following way: When the second ray fell upon $R$, its course after reflection would be different if it found $R$ in a different position. From geometrical considerations it follows that if $R$ has turned in the interval through an angle $a$, then the new direction after the reflection will differ from the old by twice this amount, $2a$. In order to make clear that an angular motion of the mirror will result in an angular displacement of the reflected ray equal to double the amount of the corresponding displacement of the mirror, consider Fig. 2, where $M M$ represents the mirror, $A B$ the incident ray, and $B C$ the ray after reflection. Since the angle of incidence is equal to the angle of reflection, we have angle $A B N$ = angle $C B N$ ($B N$ being normal to the surface $M M$ at the point $B$). If the mirror is displaced through the angle $M B M'$, the normal will suffer a like displacement. That is, angle $N B N'$ = angle $M B M'$. Now angle $A B N'$ — angle $A B N$ = angle $N B N'$. Multiplying both sides of this equation by 2, we have 2 angle $A B N'$ — 2 angle $A B N$ = 2 angle $N B N'$; that is to say, angle $A B C'$ — angle $A B C$ = 2 angle $N B N'$. Or, angle $C B C'$ = 2 angle $N B N'$. Finally, angle $C B C'$ = 2 angle $M B M'$.

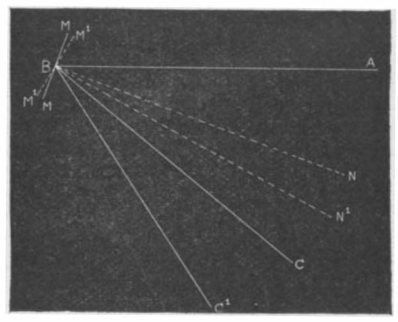



Fig. 2.

By taking into account the length of time required by $R$ (Fig. 2) to make a complete rotation, and ascertaining the angle $a$—by measuring the displacement $L_1 L_2$, and so calculating the angle $2a$—the small interval of time required by $R$ to rotate through the angle $a$ can be determined. The velocity of light immediately follows by dividing this time into the distance $2(C M)$. This method was probably never carried out in precise form. Foucault's method, to be referred to later, is largely the same, however.

Fizeau in 1849 determined the velocity of light by

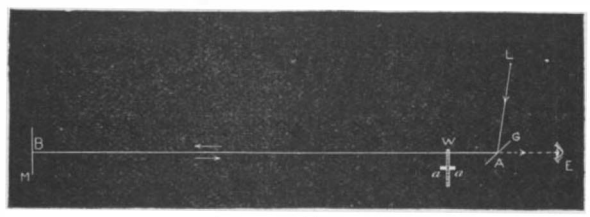



Fig. 3.

a method essentially that which follows. (Refer to Fig. 3.) $L$ is a source of light, $G$ is a glass plate. A ray of light falling upon $G$ is partially reflected to a fixed mirror $M$, pursuing the direction $A B$. It is then reflected back to $A$, where it will be in part transmitted through $G$ to the eye at $E$. A toothed wheel $W$ is interposed in the path $A B$. The height of the wheel teeth is precisely the same as the intervals between them. The wheel can be rotated at high speed upon the axis $a a$. When the wheel is at rest or rotating

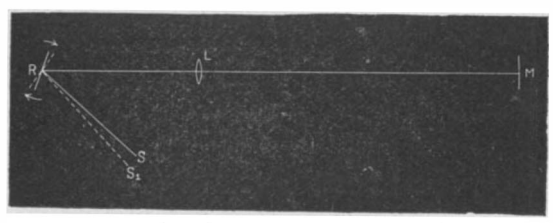



Fig. 4.

very slowly, and so situated that the light proceeding toward $B$ passes between a pair of the teeth, the reflected ray will do the same, and the eye will receive a series of bright impressions. If the velocity is increased so that the interruptions are more than 10 per second, the eye will perceive a steady light on account of the persistence of retinal excitation. But by gradually increasing the velocity of the wheel, a degree of rapidity may be attained when the light passing through the opening between a pair of teeth will be caught upon reflection squarely upon the tooth following the opening. This will then take place with every ray starting from $L$ and reflected at $A$. No light will therefore be received by the eye. The time occupied by light in making the trip $W B + B W = 2(B W)$ is the same as that taken by the rotating wheel to rotate from the center of an opening to the center of a tooth, that is, one tooth. This is Fizeau's method, and yielded in his hands, the distance $B W$ being 5.4 miles, the excessive result of 196,000 miles per second. Cornu by the same method, but with possibilities of error decreased, arrived at the result of 185,420 miles per second.

Foucault's method, as already noted, was similar to that due to Wheatstone and Arago. In essence it was as follows (Fig. 4): $S$ is a source of light, rays from which after impinging on the rotatable mirror $R$ are reflected through the lens $L$ to the fixed mirror $M$. Upon re-reflection, if the mirror $R$ is in rotation as indicated by the arrows, there will be an angular displacement $R S_1$ of the beam of light equal to twice the angular motion of $R$ during the time of the transmission of light along the path $R M + M R = 2(R M)$. By this method, the velocity of light has been calculated as 185,157 miles per second.

Prof. A. A. Michelson, of the University of Chicago, who recently received one of the Nobel prizes for his investigations of the velocity of light, adopted a similar method. In one of Prof. Michelson's experiments, the following values were assumed or found:

$R M$ = 24589.4 inches; $R S$ = 401.98 inches; $S S_1$ = 5.421 inches; 257.9 = rotations per second of the mirror $R$. The angle $S R S_1$ is consequently $\frac{5.421}{2 \pi 401.98}$ of a total rotation. One-half of this is the part of a total rotation made by the mirror $R$, i. e. $\frac{5.421}{4 \pi 401.98}$. But an entire rotation of the mirror is accomplished in $\frac{1}{257.9}$ of a second. Therefore, the time occupied by the mirror in accomplishing the displacement of $R S$ to $R S_1$ is

$$\frac{5.421}{4 \pi 401.98} \times \frac{1}{257.9} \text{ of a second.}$$

To determine the number of inches traversed in one second, we must divide the entire path, $2 \times 24589.4$ inches, by the number of seconds. We shall have therefore

$$2 \times 24{,}589.4 \times \left( \frac{4 \pi 401.98 \times 257.9}{5.421} \right) \text{ inches per second.}$$

This reduces to 186,531 miles per second.

In 1902 Prof. Michelson published a method which combines features of the methods of both Foucault and Fizeau. To make this clear, reference is had to Fig. 5. The light starts from a source to the right of the slit $a$, passes through the glass plate $P$ (which is only lightly silvered) and the lens $e$. Next it falls upon $b$, one side of a rotatable mirror, and is reflected to the grating $c$, where an image of the slit is formed. The light is now reflected to the side $d$ of the rotatable mirror, from which it is reflected through the lens $f$ to a very distant mirror (not shown). From this mirror it is re-reflected and, if the mirror $b d$ remains stationary, it will retrace its course. An eye placed at $a$ will perceive a portion of this return light by reflection from $P$. However, the aperture of the rotatable mirror and the space between lines of the grating may mutually be so adjusted that a definite small angular movement of the mirror during the passage of the light from the apparatus to the distant mirror and return will cause the return light to fall upon the line ruled between two grating spaces. Increasing the rate of rotation of the mirror—i. e., increasing the angular movement between dispatch of the light to and return from the distant mirror—the return beam will be displaced to the next grating space. In the former case, no light will reach the eyepiece, and we shall have an eclipse. In the latter case, the light will reappear. By gradually working up the speed of the rotating mirror, we may count the number of eclipses intervening between rest and any given degree of angular velocity. That is to say, we can determine in this way the number of grating spaces over which the displacement occurs for any given velocity. This will afford a basis of determining with great accuracy the infinitesimal period of time occupied by light in making the round trip. The determination of its velocity immediately follows, and is found to be 186,380 miles per second.

If the field winding of a homopolar (unipolar) dynamo be connected as a shunt across the terminals of the machine, the great increase in the contact drop between the end-rings and brushes which occurs with increase of load results in a considerable weakening of

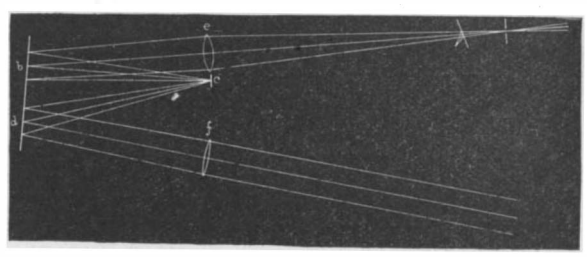


Fig. 5.

the field and in poor voltage regulation. In order to maintain the exciting current constant in spite of changes in the load, E. Thomson has patented the following arrangement. The field is connected, through brushes, to two-end rings belonging to the same conductor; this may be either a special conductor provided for the purpose, or it may be one of the armature conductors; in the latter case, the conductor must obviously have a larger area than the other conductors, in order to enable it to carry the larger current without undue heating.

# Patent Department

## PLACER MINING BY A COMBINATION OF HYDRAULIC AND ELECTRIC METHODS.

The illustration shows a method of placer mining in the gravels of the Klondike and the Alaska northland described by Dr. Willis E. Everette, which it is believed will be less expensive and more complete than the present method of dredging the gold-bearing gravel bottoms of the rivers and streams throughout the Klondike region. Owing to the long-closed season during the fall, winter, and spring months, operations by water are restricted to three or four months in the summer. For this reason it is necessary to utilize dredgers of large capacity to produce paying results. The dredger also cannot reach all of the broken surface crevices of bed rock. The loss, because of this, in some instances amounts to as much as twenty per cent of the amount of gold obtained from the overburden of gravel.

During the summer season, owing to the melting of snow and ice, there is an abundance of water flowing down the many hills and mountains through small canyons to the various streams.

The combined hydraulic and electric plan of placer mining consists in erecting a dam across the creek or stream some little distance above the location to be excavated, enough to secure a pressure of water of at least 90 pounds to the square inch, and divert the overflow from the dam through a canal along the bank of the stream around the location, to the stream below. The water from the reservoir above is piped down to the nozzle of a "giant" hydraulic pipe under the pressure previously mentioned, by means of which the entire contents of the valley above the dumping shaft is economically torn out for several hundred feet and by gravity is washed into the sump excavated in the bed rock as shown.

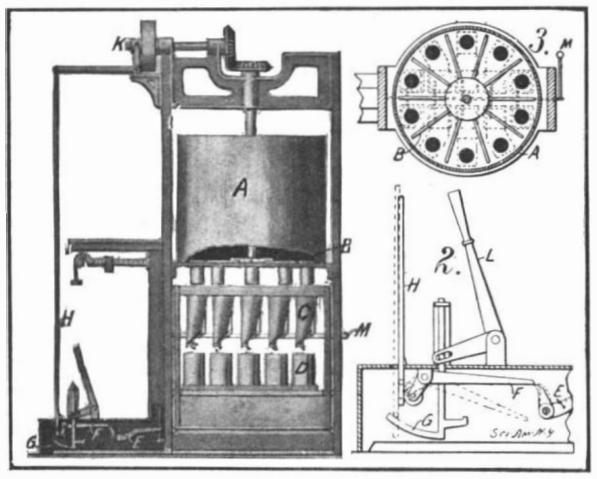
From some distant central point, by means of large water electric power plant, the electric current is conducted to a motor of 160 horse-power or more placed on the bank of the stream. This motor in turn operates a rapidly moving bucket conveyer or elevator, the lower end of which is placed in the bottom of the sump in the bed rock and carries upward from the sump the mixed water and gravel as rapidly as it falls into the sump, discharging the contents into a flume above which conveys the gold content to the usual sluice ways farther down the stream for extracting the gold, the tailings passing on to any desired farther point. As soon as a sufficient extent of the gravel has been hydraulicked off into the bed rock sump, the now exposed bed rock can be dug into by hand labor, and another supply of gold recovered, by ground-sluicing this bed rock debris into the sump.

In conducting the working operations, the muck and earthy overburden on the frozen gravels are to be ground-sluiced off and down into the gravel for an area of several acres. The frozen gravel is now exposed to the intense heat of the summer sunshine of the Northland, and it rapidly thaws. By successive washings and exposures to the air and heat the gravel is removed clear down to the bed rock.

When the distance becomes so great as to make it no longer economical to hydraulic the valley gravel down into the dumping shaft, then a new sump can be made at the upper end of the first workings. The elevator and electric motor is then removed up to the new sump, and the tailings can be discharged into the now worked-out valley below the new sump. In this way several different sections of a valley can be thoroughly worked out and almost all of the gold content be secured. It is destined to become an attractive and effective method of mining, since the use of fuel to generate steam and expensive steam boilers for producing power, are avoided.

## AUTOMATIC WEIGHING MACHINE.

The accompanying engraving illustrates an automatic machine for filling a series of receptacles at a time with powders or granulated commodities, and




AUTOMATIC WEIGHING MACHINE.

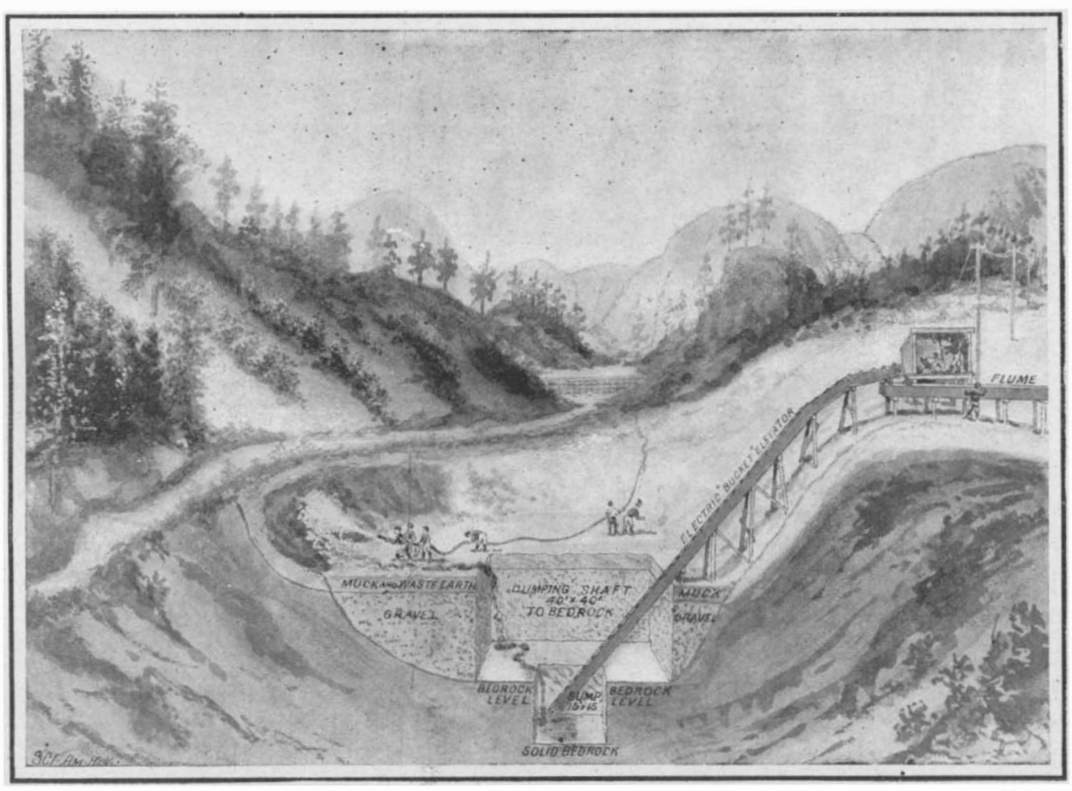
accurately weighing these commodities in even proportions in each of the several receptacles. The machine comprises a frame, which is set over the platform of a weighing scale. In this frame a reservoir *A* is mounted, in which the commodity to be measured and weighed is placed. The bottom of this reservoir is provided with a series of openings, preferably covered with screens. Secured to a shaft which enters the reservoir *A* is an agitator *B*, which is arranged to sweep over the screened openings and prevent them from clogging. Depending from each screened opening is a spout, which leads into a hopper *C*. Each of the hoppers is provided at its lower end with a gate. The gates are normally held in closed position by means of springs, but may be opened by operating a rod *M*. The hoppers are mounted on a frame, which rests on the scale platform, and supported in a carrier beneath them are the receptacles *D*, which are to be filled with the commodity in the reservoir *A*. When a predetermined amount of the material has entered the hoppers *C*, the scale platform will be weighed down, carrying with it the trigger *E*. The latter releases a bell crank *F*, which in turn releases a rod *H*, and permits it to drop to the position shown by dotted lines. When the rod *H* drops it throws a clutch *K*, which brings the agitator *B* to a stop. The operator then throws the lever *M* to discharge the contents of the hoppers *C* into the receptacles *D*. A new set of receptacles is then placed under the hoppers. By operating the lever *L*, the rod *G* is raised. This is provided with a prong, which lifts the rod *H* and resets the trip mechanism, at the same time throwing the clutch *K* and starting the agitator *B*, to again fill the hoppers *C*. The inventor of this improved weighing machine is Mr. George H. Mallett, of Copake, N. Y.

## A New Electric Clock on the Eiffel Tower in Paris.

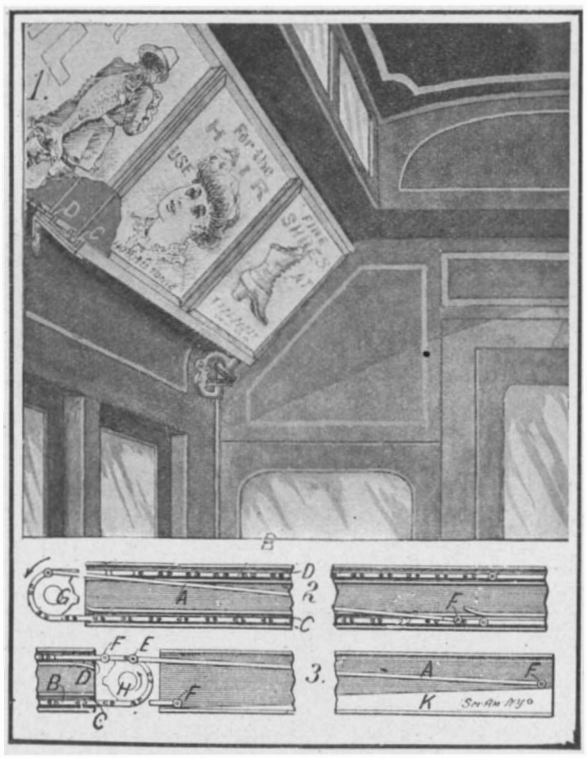
All Paris can now turn to the Eiffel Tower when it wishes to know the time after dark, in place of being dependent on church clocks and other, often unilluminated sources of this necessary information. For some time past, the hour of noon has been announced by a cannon shot from the tower, but the usefulness of the big structure as a timekeeper is not to end with this. The idea of employing the great structure as a nocturnal time piece has been ingeniously worked out, and in place of an ordinary dial, an electric illuminating apparatus controlled by a horological movement and located on the second platform, indicates the correct time, minute by minute, in enormous figures visible at a long distance from many points in Paris and the suburban sections. The appearance of the tower at night with its brightly conspicuous figures, is very attractive.

## TRAVELING CARDS FOR CAR ADVERTISING.

The advertising cards in one of Chicago's elevated railway cars, instead of being secured in fixed position, are arranged to travel slowly from one end of the car to the other. The advertisements are thus made much more attractive, because their motion draws attention, and brings each advertisement opposite each passenger in the car. The cards are arranged in an endless chain, and hence furnish double the usual renting space, for behind the cards which are in view, there is an equal number of cards on the return course, which will in turn be displayed. The mechanism used is very simple, and is clearly shown in the accompanying engraving. The cards are carried in frames *A*, each of which is pivoted at one end to an endless chain *B*. The frames *A* are guided at the top and bottom in grooves *C* and *D*, traveling in grooves *C* when in the display position. The chain *B* travels in the lower guideways *C* and *D*, and the pintle rods on which the frames *A* are pivoted are extensions of certain of the pivot pins of the chain. The upper end of each pintle rod carries a roller *E*, adapted to travel in the guides. The opposite end of each frame *A* is provided with a roller *F*, also adapted to travel in the guides, but not extending to the height of the roller *E*. Near each end of the car the inner walls of the guideways *C* and *D* are reduced, to permit the rollers *F* to clear them. Following the usual custom the cards are mounted in an inclined position, and when the frames reach the reduced walls of the guideway *D*, they will swing forward on the pintle rods to the position shown in Fig. 2. Then, as the pivoted end is carried around the sprocket wheel *G*, on which the chain travels, the opposite end of each frame *A* will be forced into the groove *C*, and thereafter the frame will travel along this groove in the display position. When the opposite end of the car is reached, the end *E* will be forced back by a wedge block *K*, while the pivoted end travels about the sprocket wheel *H*, and enters the return groove *D*. The mechanism is geared to a vertical driving shaft connected with the driving mechanism of the car. At each end of the display rack fixed cards are set in place, to cover the traveling cards as they shift from the grooves *C* to *D*, and *vice versa*. A patent on this improved advertising apparatus has been secured by Messrs. F. L. Reynolds and M. T. Ash, of 315 Dearborn Street, Chicago, Ill.




A HYDRAULIC-ELECTRIC SYSTEM OF PLACER MINING.




TRAVELING CARDS FOR CAR ADVERTISING.

## RECENTLY PATENTED INVENTIONS.

### Pertaining to Apparel.

GARMENT-FORM.—W. F. PALMENBERG and E. T. PALMENBERG, New York, N. Y. The object of the present invention is to provide a form provided with a shoulder padding extender, arranged to compensate for any additional building up required in the shoulders at the same time maintaining correct contour of the upper arm portion. It relates to forms such as shown and described in Letters Patent of the U. S., formerly granted to Mr. W. F. Palmenberg.

### Electrical Devices.

THIRD RAIL.—R. K. EDDOWES, Philadelphia, Pa. The more particular purpose in this invention is the provision of a type of rail consisting of an outer body portion supporting the conducting member or members, face downward, and so connected electrically as to possess several advantages. The sections are held in position upon four sides, their lower faces not readily accessible to man or beast, so there is little probability of accidents.

### Of Interest to Farmers.

BALING-PRESS.—F. B. CUMPSTON, Blooming Grove, Texas. The object of the invention is to produce a press which will feed itself automatically, and which is provided with a packing cylinder for advancing the cotton or straw into the baling chamber; the arrangement being such that the feed takes place automatically so that the operation of the packing plunger is also automatic.

MACHINE FOR WORKING THE SOIL.—L. F. BASSETT, Redding, Cal. In this instance the object is the provision of a machine adapted to break up or pulverize the soil of a field after it has been plowed and perhaps partially harrowed down, the machine being an improvement on the one for which Letters Patent were formerly granted to Mr. Bassett.

### Of General Interest.

NON-REFILLABLE BOTTLE.—I. I. KREMER, New York, N. Y. The essential feature of the construction involves a valve, having a substantially hemispherical seating portion and an oscillating portion extending therefrom, and so constructed that the last-mentioned portion may be oscillated as the bottle is inclined, without removing the valve from its seat until after the bottle has been inclined to a predetermined distance.

LARD-SCOOP.—H. L. ADAMS and L. O. WELLS, Bonneterre, Mo. The invention pertains to lard and butter scoops, and the object is to provide a scoop intended for use in grocery stores or similar places where butter is to be removed in small quantities from large receptacles such as barrels or tubs.

### Hardware.

MARKING GAGE.—ABRAHAM SOLOMON, 113 East 120th Street, New York. A complete description of this invention, which is especially adapted for the use of carpenters, joiners, cabinet makers, and the like, appeared in our issue of January 4, 1908, but by mistake the address of the inventor was published as 113 West instead of 113 East 120th Street.

### Machines and Mechanical Devices.

WATER-SWIVEL.—K. BROOKS, New York, N. Y. In the present patent the improvement has reference to that class of water swivels designed for use in connection with rotary well-drilling machines where water is conducted under pressure from a pump to the point of a drill secured to the lower end of a rotating tube.

ATTACHMENT FOR MOLDS.—H. A. KEEHN and H. W. KEEHN, Newark, Ohio. The invention pertains to molds and admits of general use, but is of peculiar value in relation to glass press molds, for use in measuring exactly the quantity of glass required and for delivering the same directly into the mold with a minimum loss of time.

MACHINE FOR EXERTING PRESSURE.—E. P. GUENTHER, West Hoboken, N. J. The invention is adaptable to devices varying considerably in function, and the purpose is to provide a device for exerting pressure upon gaseous or liquid substances, being particularly serviceable as a pump to be used in connection with automobiles and like motors, or for propelling vessels.

CAN-VENT-SHIELDING MACHINE.—H. J. DOUGLASS, Bellingham, Wash. This machine is for use in applying chips or shields under the vent-hole in cans in order that the contents of the same cannot plug up this hole while the can-top is being soldered in place. The machine may also be used for feeding chips directly into the cans when filled, without the use of the soldering mechanism.

PRESSURE-TANK.—G. LEWIS and D. A. SMITH, Alto Pass, Ill. The tank is adapted to contain spraying mixtures, and to be mounted on carrying wheels or otherwise adapted to be transported from one place to another. The object of the invention is to provide a tank with means adapted to exert the desired pressure on the mixture and to force it out of the tank under such pressure.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

## Notes and Queries.

### HINTS TO CORRESPONDENTS.

**Names and Address** must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

**References** to former articles or answers should give date of paper and page or number of question.

**Inquiries** not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

**Buyers** wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

**Special Written Information** on matters of personal rather than general interest cannot be expected without remuneration.

**Scientific American Supplements** referred to may be had at the office. Price 10 cents each.

**Books** referred to promptly supplied on receipt of price.

**Minerals** sent for examination should be distinctly marked or labeled.

(10657) H. F. asks: 1. Will iron sink to the bottom of the ocean, or will it sink only to a certain depth and remain there on account of the enormous pressure of the water above it? A. Iron will sink to the bottom of the ocean, no matter how deep it may be. This has been discussed at great length quite recently in Notes and Queries. See SCIENTIFIC AMERICAN, vol. 96, Nos. 9, 11, 13, and 19. We send these for 10 cents each. Anything sinks in a liquid when it weighs more than the same volume of that liquid weighs. This is in accordance with the principle of physics called Archimedes's Principle, which was discovered by the philosopher of that name. A cubic foot of iron is more than 400 pounds heavier than a cubic foot of water. This causes it to sink in water. The pressure of the water above the iron does not cause it to sink. The excess of the weight of the iron over the weight of the same volume of water causes the iron to sink. For further discussion see the notes referred to above. 2. Do seamen experience any trouble in sounding because the chain will not sink? A. There is no difficulty in sounding in any depth of water. A fine steel wire is employed in deep-sea sounding. A heavy weight is attached to the wire. This takes the wire down. When the weight touches bottom it is dropped off automatically, and the wire is hauled in with comparative ease. No place has been found in the ocean which cannot be sounded. Any difficulty in sounding is not due to the depth of the water, but to the friction between the water and the wire or sounding line.

(10658) J. A. B. asks: Will you please publish the formula for coloring electric lamps? A. A process for coloring incandescent lamp bulbs by dipping will be found in the Notes and Queries column of SCIENTIFIC AMERICAN No. 10, vol. 74, price 10 cents. We would advise that you buy the coloring compound, which is to be had from dealers in electrical supplies everywhere. It will be cheaper and better than to attempt to make it yourself.

(10659) E. E. W. asks: Will you please inform us what is the freezing point of the following solutions: 1/3 glycerine, 2/3 water; 1/4 glycerine, 3/4 water. The glycerine used in the above solution to be 29 deg. Baume. A. We regret that we have not the freezing points for the percentage solutions of glycerine and water which you desire. We find that a solution 10 parts in 100 freezes at 2.32 deg. C. below zero; solution 12 parts in 100 freezes at 2.83 deg. C. below zero; and a solution of 50 parts in 100 parts of water freezes at 31 deg. C. below zero. This gives about 0.3 deg. C. per part of glycerine in 100 parts of water. To apply this to your proportions, a solution 1/3 glycerine and 2/3 water would contain 50 parts glycerine to 100 parts water. At 0.3 deg. C. per part glycerine, the freezing point would be lowered 15 deg. or 27 deg. F., which corresponds to 5 deg. F. above zero. In the second case, a solution 1/4 glycerine and 3/4 water would contain 33 1/3 parts glycerine to 100 parts water, and the freezing point would be lowered 10 deg. C. or 18 deg. F. Such a solution would freeze at about 14 deg. F. These results are not assumed to be exact, but are not probably far from correct, perhaps sufficiently so for practical use.

(10660) R. H. D. asks: Which has the greater lifting power—a block and fall with the line run from the drum over stationary sheave, down through traveling block, back and fasten by stationary sheave; or to have second stationary sheave run over that and back to block, and fasten on to traveling block? One would be three falls, the other two. A. Any system of pulleys has a lifting factor the same as the number of parts of rope supporting the traveling block. Stationary blocks have no effect upon the lifting power. They simply serve to change the direction of the pull. One of your sketches shows two, the other three parts of rope supporting the traveling block. The first would theoretically lift a weight twice as great as the power, and the second would lift three times the power. All pulleys are subject to a large deduction because of friction, and no practical value can be determined from the theoretical rule.

## NEW BOOKS, ETC.

KANT UND DIE NATURWISSENSCHAFT. By Prof. Dr. Edm. König. Braunschweig: Fried, Vieweg und Sohn, 1907. 12mo.; pp. 232. Price, $2.

Prof. König in this work has given us a very complete and authoritative *résumé* of Kant's position in natural science, welding the great German philosopher's metaphysical inquiries with his achievements in the more exact sciences so firmly together that he has presented a very complete picture of the natural philosophical system of Kant. After discussing in an introductory chapter the relation of natural science to philosophy, Prof. König proceeds to place Kant in his proper position in the natural science of his time. His influence on the natural science of the nineteenth century constitutes the subject of the fourth chapter. The problem of space and motion is next considered, and Kant's contributions to the solution of that problem, and notably his cosmogony, discussed. The closing chapters deal with a critique of causality and biological and psychophysical problems.

LABORATORY WORK IN ELECTRICAL ENGINEERING. By John Roberts, Jr. New York: D. Van Nostrand Company, 1906. Cloth; 5½ by 8½ inches; 218 pages, 108 figures. Price, $2 net.

The difficulty of instructing a class in the methods of electrical measurement and the other manipulations preceding the more advanced work on dynamos and motors, without a suitable laboratory manual, has led to the compilation of this book. It contains, besides chapters on the more purely physical measurements of resistance, E. M. F. and current, special chapters devoted to the potentiometer and the calibration of measuring instruments. The last chapter consists of a series of experiments of a purely technological nature, together with problems, all of which have been worked out by the author's own pupils.

COMPUTATION AND MENSURATION. By P. A. Lambert. New York: The Macmillan Company. 16mo.; cloth; 92 pages. Price, 80 cents.

A textbook intended to bridge the transition stage between secondary school and college. The problems are to be worked out by the student by aid of his texts on algebra, geometry, and trigonometry, and are designed to train his mind to adapt the rules he has learnt to the wider scope of college education.

PRACTICAL WRINKLES FOR THE PLUMBER. A Collection of Valuable and Handy Methods, Devices, and Contrivances in Plumbing Work. By R. M. Starbuck. Hartford, Conn.: R. M. Starbuck & Co. 16mo.; cloth; 137 pages, illustrated. Price, $1.

A splendid collection of directions and receipts for plumbers. It is quite remarkable so much information should be placed within a work of the convenient size of "Practical Wrinkles for the Plumber."

ESSAY ON THE CREATIVE IMAGINATION. By Th. Ribot. Translated from the French by Albert H. N. Baron. Chicago: The Open Court Publishing Company. 12mo.; cloth; 370 pages. Price, $1.75.

The name of Th. Ribot has for many years been familiar in America, so that no mention of his attainments, nor of his ability to write upon psychological subjects is necessary. It is enough to say that he treats of the phenomena of the imagination in his usual interesting and discerning style in this highly characteristic work.

MACHINE SHOP WORK. A Manual of Approved Methods in Modern American Shop Practice. Including the Construction and Use of the Latest Types of Improved Tools and Machines and Other Details of Modern Shop Equipment and Operation. By Frederick W. Turner. Chicago: American School of Correspondence. Illustrated. 8vo.; cloth; 190 pages. Price, $1.50.

"Machine Shop Work" embraces the classes of cold metal work in which portions of the material are removed either by hand-tools or by machinery. The book is divided into four sections: "Tools Operated by Hand," "The Lathe," "Drill Press and Planing Machines," and "Milling and Grinding Machines." The need of a practical working guide is largely met by this book. It is free from mere theoretical discussion, and is particularly adapted to home study by men who have no time to approach the subject by devious routes.

THE NAVAL POCKET-BOOK. Founded by Sir W. Laird Clowes. Edited by Geoffrey S. Laird Clowes. London: W. Thacker & Co. Pocket size. Pp. 966. Price, $3.

This compact pocket-book, now in its twelfth year, has such a worldwide reputation, that the reviewer need do no more than state the nature of its contents—their quality is assured. Starting with a comparative summary of the fighting fleets of the leading naval powers, the work immediately takes up the detailed classification of every fighting ship, big or little, in all the world's navies; and to this part of the work some 600 pages are allotted. Under each warship are to be found the following items of information: The Builder; the Place and Date of the Ship's Launch, or Floating out of Dock for the First Time; and Notes Concerning the Date of Laying Down and of Reconstruction or Rearmament. Also the leading particulars of the engines and boilers are given; the nature of the protection, under which is included the thickness of the deck, the waterline belt, the casemate protection, and the gun shields, hoists, conning tower, etc. Under the head of armament for each ship is given the number of guns, their caliber and method of mounting, also the number of torpedo tubes and the size and number of the torpedoes. Then follow complete tables of the various types of guns manufactured by each government and private maker, in which is detailed the particulars of projectiles, length of bore, muzzle velocity, energy, etc. These tables are particularly complete, and include the lighter rapid-fire guns and small arms. The work includes tables of the drydocks of the world; their dimensions, capacity, etc. Perhaps the most attractive portion of the pocket-book, at least to the layman, will be the 130 pages containing a side elevation and deck plan, showing the armor and armament of each type of ship, the thickness of the armor, and the size of the guns.

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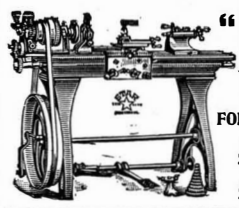

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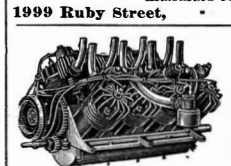

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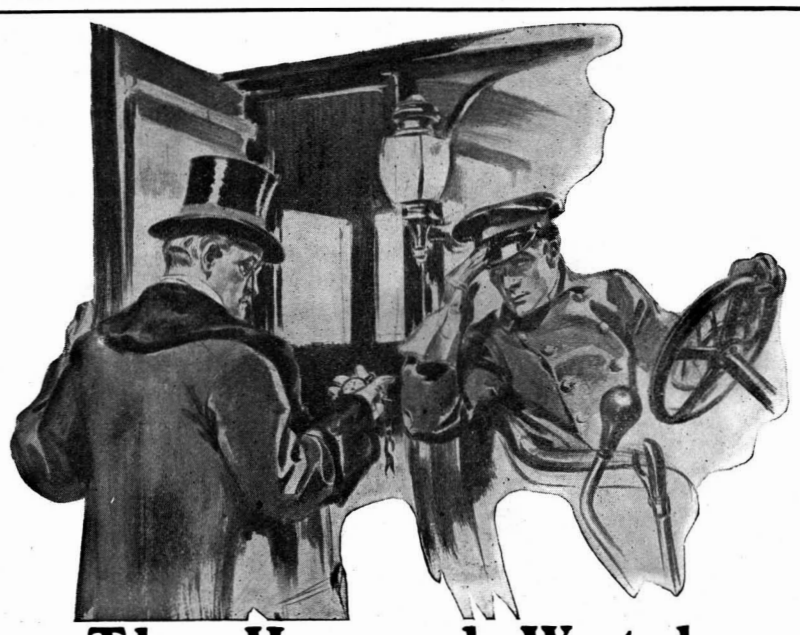

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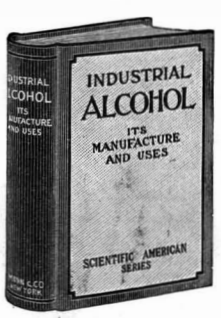


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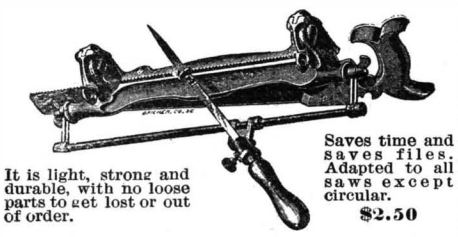

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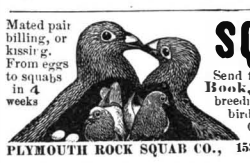

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| Condition powder for horses, cattle, sheep, and swine, G. C. Hanford Manufacturing Co. | 66,904 |
| Cutlery and edge tools, certain, Freeman, Delamater & Co. | 66,949 |
| Dress shields and hose supporters, Kora Co. | 66,967 |
| Fertilizers, Virginia-Carolina Chemical Co. | 66,941 to 66,943 |
| Flour, pancake, Allen Brothers Co. | 66,913 |
| Flour, wheat, Columbia Mill & Elevator Co. | 66,918 |
| Flour, wheat, Minot Flour Mill Co. | 66,929 |
| Foods, certain, Allen Brothers Co. | 66,914 |
| Foods, certain, Reiss & Brady | 66,931 |
| Foods, certain sea, E. Shivell | 66,936 |
| Fruits and catsup, dried, Drake & Co. | 66,948 |
| Glass vessels with vacuum between the walls, double walled, Thermos-Gesellschaft m. b. H. | 67,002, |
| Graphophones, Columbia Phonograph Co., general | 66,997 |
| Gum, chewing, Baltimore Chewing Gum Co. | 66,916 |
| Gums, chewing, National Candy Co. | 66,930 |
| Guns, rifles, and revolvers, shot, Harrington & Richardson Arms Co. | 66,950 |
| Hammers, Wiebusch & Hilger | 66,956 |
| Honey, W. A. Selser | 66,935 |
| Hosiery, Richmond Hosiery Mills | 66,971 |
| Ice cream freezers, Sturges & Burn Mfg. Co. | 66,955 |
| Knitted underwear, Troy Knitting Co. | 67,003 |
| Leather goods, certain, J. M. Delaney & Co. | 66,980 |
| Leather goods, certain, W. R. Thomlinson | 66,994 |
| Leather goods, certain Woodward & Cochey | 66,995 |
| Ledgers, loose leaf, C. L. Schaar | 66,992 |
| Lighting apparatus, certain, Aurora Mantle Mfg. Co. | 66,977 |
| Lime and ready mixed mortar, Rockland-Rockport Lime Co. | 66,932 |
| Linen, bed and table, Mosse Gebruder | 66,989 |
| Macaroni and vermicelli, V. Savarese & Bros. | 66,934 |
| Meats, lard, and sausage, Kingan & Co. | 66,928 |
| Medicine, certain, C. T. Nelsen | 66,908 |
| Medicine, tonic, B. Miller | 66,906 |
| Medicine, veterinary, J. A. Cotten | 66,901 |
| Metal manufactures, certain, J. Dewsbury & Son | 66,919 |
| Oats and wheat flour, rolled, Allen Brothers Co. | 66,912 |
| Oats, rolled, Atchison Oat Meal and Cereal Co. | 66,915 |
| Ointment, Dermatone Co. | 66,902 |
| Overalls, S. Cohen | 66,957 |
| Paper bags, Cleveland-Akron Bag Co. | 66,996 |
| Pencil eraser holders, lead, American Lead Pencil Co. | 66,976 |
| Pharmaceutical preparation for the skin, Vi-Dermis Co. | 66,910 |
| Razors, Simmons Hardware Co. | 66,953 |
| Remedies for female use, Bradfield Regulator Co. | 66,892 to 66,900 |
| Remedy, rheumatic, Morris Chemical Co. | 66,907 |
| Rubber boots and shoes, Goodyear's Metallic Rubber Shoe Co. | 66,959 |
| Rubber boots and shoes, L. Candee & Co., | 66,968 to 66,970 |
| Rubber boots and shoes, Woonsocket Rubber Co. | 66,973 to 66,975 |
| Rubber boots and shoes, Goodyear's Metallic Rubber Shoe Co. | 66,985, 66,986 |
| Rubber footwear and rubber tires for motor vehicles, Hood Rubber Co. | 66,987 |
| Rubber goods, certain, Scandinavian Fur & Leather Co. | 66,991 |
| Salves, Well Chemical Mfg. Co. | 66,911 |
| Sash cord, braided, Samson Cordage Works | 66,933 |
| Shoes, leather, Stern & Co. (Incorporated) | 66,993 |
| Silver lead or plumbago foundry facings and pulverized graphite, United States Graphite Co. | 66,940 |
| Soap, Procter & Gamble Co. | 66,990 |
| Tablets for diseases of the blood and the nervous system, Dr. Hunter Chemical Co. | 66,905 |
| Telegraphic apparatus and electric batteries, J. H. Bunnell & Co. | 66,927 |
| Tires, boots, and shoes, rubber, Hood Rubber Co. | 66,966 |
| Tobacco pouches, Wm. Warne & Co. | 67,004 |
| Tobacco, smoking, Falk Tobacco Co. | 66,982 |
| Washing machines, Richmond Cedar Works | 66,952 |
| Watches and watch movements, B. L. Strasburger & Co. | 66,998 to 67,001 |
| Whisky, Stitzel Distilling Co. | 66,954 |

## LABELS.

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| "Anco," for coffee, Sherman-Cosner Mercantile Co. | 13,972 |
| "Candy and Jewelry, for confectionery, L. Schulman & Co. | 13,970 |
| "Crucible Cough Remedy," for cough remedy, C. Rollberg | 13,974 |
| "Eminola," for cigars, Schmidt & Co. | 13,969 |
| "Espiola," for cigars, Schmidt & Co. | 13,967 |
| "Foxy Ma Kindergarten Game," for a game, H. D. Gardy | 13,980 |
| "Headless Rivets," for rivets, Edwin B. Stimpson Co. | 13,981 |
| "La Premonette," for cigars, Schmidt & Co. | 13,968 |
| "La Ritica," for cigars, Schmidt & Co. | 13,966 |
| "Peptonol," for extract of cod liver oil, Standard Drug and Chemical Co. | 13,973 |
| "Sanative Wash," for a preparation for women's ailments, Lydia E. Pinkham Medicine Co. | 13,978 |
| "Sober Up," for a liquid preparation, consisting of a combination of drugs, used for the purpose of overcoming the effect of too much intoxicating liquor, Wm. Strauss Co. | 13,976 |
| "Standard Soluble Sulphur Compound," for a soluble sulfur compound, Standard Soluble Sulphur Co. | 13,979 |
| "The Cincinnati Enquirer," for cigars, J. A. Cheney | 13,964 |
| "The Highest Grade Butter from the Maple Creamery," for butter, T. C. Ford | 13,971 |
| "Tige-Mar Remedy Co.," for a salve, Davies & Myers | 13,977 |
| "Tubular Rivets," for rivets, Edwin B. Stimpson Co. | 13,982 |
| "Y. M. C. A. Cigar," for cigars, J. H. Sacks | 13,965 |
| "Yosemite Royal Flush Aperient Water," for an aperient water, Yosemite Mineral Water Co. | 13,975 |

## PRINTS.

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| "Combo Comic-Nature Fakes," for comic cards, F. L. Fithian | 2,189 |
| "Men's Apparel," for men's apparel, W. C. Both | 2,190 |

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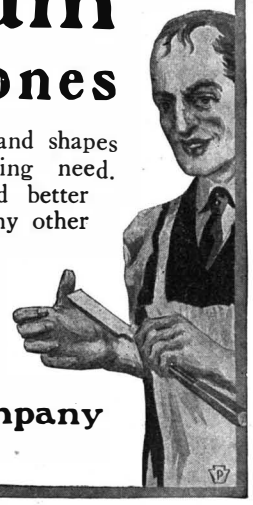

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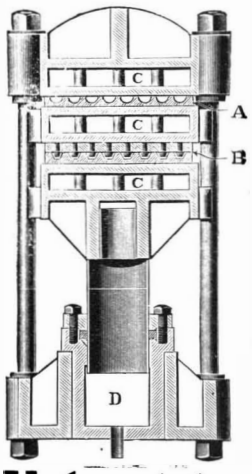


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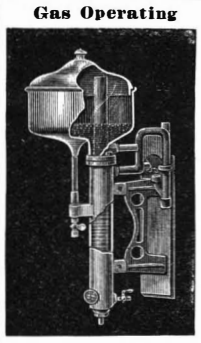

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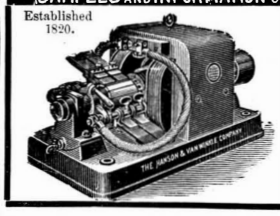

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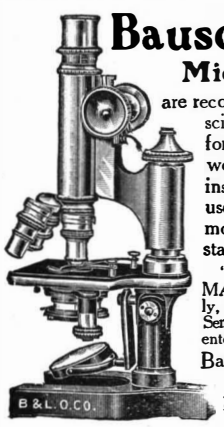


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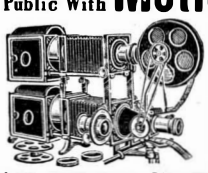

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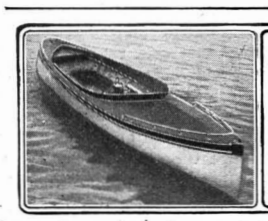

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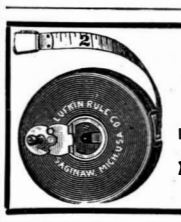

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